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CHICAGO, NOVEMBER, 1914

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CHICAGO'S SERVICE BUREAU.

CHICAGO has a department of public service which passes on the public relations of the city's service corporations in much the same way that state commissions handle similar questions. The telephone bureau is an important part of this organization and its activities are becoming quite interesting. The scope of its work is outlined in an article on another page. Those who persist in the impression that municipal employment is a sinecure would view with considerable astonishment the strenuous industry of the occupants of Room 613, Chicago City Hall. The bureau has been particularly fortunate in the selection of its head and his assistant, who are both well known to both Bell and independent telephone interests and thoroughly familiar with their problems. As an illustration of the success of its efforts thus far, the summary of complaints at the close of its annual report, just issued, shows that in 82.7 per cent of the cases the request of the complainant was granted in full, and in only 6.6 per cent was the bureau unable to secure any concession. These latter cases were based chiefly on misunderstandings which needed only to be explained, and there are few cases on record where the complainant has not been entirely satisfied. Besides bearing witness to the efficiency of the bureau, this provides also an interesting commentary on the nature of the complaints, which —afar from usual condition—seem to have been quite reasonable as a rule.

The bureau is at present engaged on a count of the subscribers of the Illinois Telephone and Telegraph Company—an undertaking which accounts for much of the present high tension of activity in the office. Because of the clause in the company's franchise which provides for its forfeiture to the city if it failed to show twenty thousand bona fide subscribers after a certain date, or if it should negotiate for the sale of its property to a competing company, it is necessary to determine if the company actually has the requisite number of subscribers.

In work of this kind it is not sufficient merely to count the names listed in the company's directory. Nor is it even enough to call each of these numbers once and abide by the result. It is quite evident that a company anticipating such a test could seriously impair its accuracy without much trouble. Repeated tests of each line and verification of each result are necessary to an accurate report. This work the telephone bureau is doing.

Meanwhile a curious complication has entered the situation. The last official act of Corporation Counsel William H. Sexton of Chicago before resigning to engage in private practice was to approve an opinion putting a new construction on the word "serving" as it appeared in the ordinance creating the company's franchise. Mr. Sexton's version is that the word "serving" really

means "capable of serving should service be required," or, as we generally state it, "readiness to serve."

This opinion was not well received by the city officials for obvious reasons. It is a legal quibble of the most sophistical character. Whatever meaning may be read into it by an inspired imagination, the clause under discussion could have meant nothing else than that twenty thousand subscribers were being given service, for which they had signed orders expressing their readiness to pay the regular rates, and it can mean nothing else now. If the clause had read "a telephone system serving 20,000 telephone stations," or words to that effect, Mr. Sexton's opinion might have some weight.

The corporation counsel, in his zeal to render a prompt opinion, may have overlooked the fact that only the first provision of the ordinance, covering the installation of the system, mentions "a telephone system *adequate* for the service of 20,000 subscribers prior to June 1, 1911." His interpretation, if applied to that clause alone, would be justified. But the vital clause, and the only one applying at this date, says: "If, *at any time after* June 1, 1911, the company shall not have in operation or shall cease to operate a system *serving* 20,000 *bona fide subscribers,*" etc. We think that is clear enough. And no one is a telephone subscriber until he has signed a service contract obligating him to pay the regular rates for the service he wants. It does not matter, of course, whether he actually uses that service or not, so long as he pays for it or is properly on the books of the company as an account. The company could not possibly be "serving 20,000 bona fide subscribers" by merely being in readiness to serve them.

There is lacking, however, a good definition of what constitutes one subscriber. Is a single business house with two trunk lines and ten p. b. x. terminal stations one subscriber, two subscribers, or ten subscribers? Is a triple partnership where each partner has his own telephone line, but all service contracts are signed by the three partners, as in some law offices, one subscriber or three? Is an office or apartment building which contracts for private branch exchange service and sublets service to its tenants one subscriber, or is each tenant a subscriber? These are some of the problems now engaging the attention of the telephone bureau. Our own opinion is that only the agent actually signing a service contract can properly be counted as a bona fide subscriber, but that each separate service contract, even by the same individual or company, constitutes a separate bona fide subscriber.

The weakness of the forfeiture clause in the Illinois Telephone and Telegraph franchise lies not in any quibble over the word "serving," nor in the definition of "subscriber." It lies in the fact that no provision is made for recompense to the company's stockholders. The clause as it stands is confiscatory. That need not prevent its operation, perhaps, but it probably will.

All these discussions of Chicago's independent system wind up inevitably, of course, in the proposal for its sale to the Chicago Telephone Company. That conclusion has been fought by several agencies, but it will doubtless be the ultimate consummation. The telephone bureau has recognized the possibility in the following excellent recommendation:

> The Chicago Telephone Company should not assume the burden of paying interest, depreciation and maintenance charges on property which it could not use at present, but which it is believed might ultimately become useful. The burden would thus eventually be shifted upon telephone users of Chicago. Should such property ever become useful to them, it should be purchased by the company at its then present value as approved by the city or by the Public Service Commission. Also, it is further believed that rather than allowing any capitalization of the tunnel rights at the present time, a valuation of same be made at the time when the Chicago Telephone Company desires the use thereof, either by the city or by the Public Service Commission, and the rights leased to the telephone company on that basis.

The report of the bureau betrays a strong approval of the automatic and semi-automatic systems, and comments on the activities of the Bell organization in acquiring automatic patents and installing, at Newark, N. J., its first automatic exchange in this country—a fact which may be news to some of our readers.

THE WAR TAX.

IN spite of our disposition to demand that everyone pay his share of a general expense, we cannot but think that the levying of a war tax on public utilities is contrary to the spirit and purpose of the modern tendency toward regulation.

During the Spanish-American war in 1898 the government imposed a tax on telephone messages and it caused no particular trouble. But the operating telephone company today is in a very different position from that it occupied sixteen years ago; and the difference is not in size only, though that discrepancy alone is enormous. The telephone company of 1898 got rates for its service that were based upon no scientific calculation of expenses and that gave it a return upon its investment that might or might not be "reasonable." In other words, the telephone company of a few years ago was in the same class with any other private business, and its profits were in proportion to is ability to manufacture service cheaply and sell it at a good price.

Today telephone and other utilities are regulated by firm governmental hands; their expenditures are predetermined for them and their profits carefully clipped to the size called "reasonable." At least that is the theory of regulation, and is rapidly becoming the practice, and it will readily be seen that any extraordinary, unforeseen and wholly foreign expense, like the present war tax, at once upsets the whole scheme and destroys its arrangement.

Now it may seem that this argument is mere quibble, for the war tax is not relatively large. But the principle is just as true for a small tax as for a large one, and, indeed, insignificant as it seems, it is calculated that it will amount to nearly a million and a half of dollars for the entire country. So it is small only in that it is made up of a vast number of insignificant charges.

The very picayune nature of these individual charges has been the stumbling block in the way of passing the charge on the telephone user—to whom it properly belongs. But in a proper observance of the principles of modern public utility practice we cannot see that the telephone company has any alternative. Unregulated utilities whose rates and returns were not dictated might properly be expected to assume the burden themselves. Under regulation and dictated rates they cannot rightly do so.

So we maintain, in spite of the suggestion of at least one state commission, that the telephone war tax will have to be passed on to the public. Just how this can be accomplished without an additional expense for bookkeeping we are not prepared to say. But the tax is levied not on telephone equipment or service, but on telephone messages, and with these the company has nothing to do

except to rent a right-of-way for them. The only burden that can properly be assumed in the matter by the telephone company is the collection of the tax.

A SERIES FOR TELEPHONE WORKERS.

A NOT uncommon fault of trade papers (oh, yes, they have their faults) is a tendency to grow more and more profound and abstruse as they get older, paying greater attention to the supernals than to the fundamentals. It behooves us to remember that we have always with us the "new man" who must start his telephone education at the beginning, and the humble worker who finds the acquisition of knowledge via his daily task rather a slow process. Everyone in the telephone field today, no matter how successful or how erudite he be, occupied that lowly position at one time. Men rise as they absorb knowledge and radiate it forth again. The quicker we can give the beginners that knowledge, the more easy we can make the process of absorbing it, the faster will be their rise.

It is a comparatively easy matter for anyone who has knowledge to put it into paper and ink so that others may have the benefit of it if they will. It is a much harder task to put it in such form that it will actually invite a reading, instead of demanding an effort of concentration that is repugnant to the tired worker. Rolling dry, technical information into sugar-coated, pleasantly flavored pills without losing its efficacy is an art.

It is the purpose of TELEPHONE ENGINEER to publish a serial article embracing the whole of modern telephone practice and covering the work of every class of telephone employe. The authorship of this series will lie in a collaboration of two well known telephone men, whose experience covers every branch of the industry and whose present connection is such as to assure their frank and impartial treatment of all subjects.

The plan followed in presenting this series will be an entirely new idea in the preparation of technical articles. The effort, of course, is to make each installment so interesting that even the uneducated worker will read it with genuine enjoyment and absorb its lessons almost unconsciously. In this effort the authors have succeeded admirably. No technical terms are used unless their meaning is made perfectly clear, and scarcely even a grammar school education will be necessary for the comprehension of the entire work.

Telephone workers of even moderate ambition will hardly need urging to take advantage of this unusual opportunity to acquire a thorough telephone education with the least possible trouble and the greatest facility and, we may even say, enjoyment. The new series will start the first of the year and subscriptions are in order now.

FOREIGN BUSINESS.

AMERICA'S enthusiasm over the possibility of building up a large export business, to replace that lost by the nations of Europe now engaged in occupations other than commercial, is quite commendable, and is serving to buoy the American industrial spirit out of a not unnatural depression. But there is a question if we are not assuming too freely that the European states, and England in particular, are incapable of continuing to handle their export business. It is true, of course, that many British industries are seriously affected by present conditions of finance and employment. But whatever the future may hold, England is not now out of the market, and is still able to handle at least a portion of the foreign business she has spent years in building up.

The European condition is terrible to a degree that the dictionary is unable to express; but even so, it is possible to overestimate its importance to business. The markets of neutral countries must be supplied, and some of that business will be lost to the belligerents and come to us, but not all of it. Let us not spend too much time and money in making preparations for a volume of foreign trade that has not yet seen any reason for switching its allegiance.

TELEPHONES FOR RURAL SCHOOLS.

WHILE there is not one country school in Kansas with a telephone in it at present, every rural school in one section of the state will be equipped with telephone service within two months, if a plan formed by officials of the Bell company proves successful.

L. F. Duggan, division commercial superintendent, and C. C. Bayless, district manager of the Wichita territory, are constantly on the alert for opportunities to expand their company's patronage. While these two men were searching their minds recently for new ideas that would develop business, they thought of the country schools. They immediately sought information from the superintendent of public instruction in every county in their district. Without exception the county officers informed the telephone officials that the telephone would be of much benefit in every country school in their counties. Telephone service would enable teachers to communicate with the county superintendent frequently about subjects that arise in the school work, they stated. These subjects arise each day and under present conditions have to be deferred until the end of the week and often forgotten or neglected. Also the service would establish closer personal relations between the teacher and the parents and would enable parents to communicate with their children at school. The service is desirable, the superintendents assert.

While awaiting the replies of the superintendents, Mr. Duggan and Mr. Bayless had been figuring the cost of installing and operating the service. They found that the company's lines run past more than 1,200 of the 1,500 rural school houses in their district. The company has decided it can install the telephones and supply service for less than 75 cents a month.

So there are still in existence new and unexplored fields for the telephone to conquer.

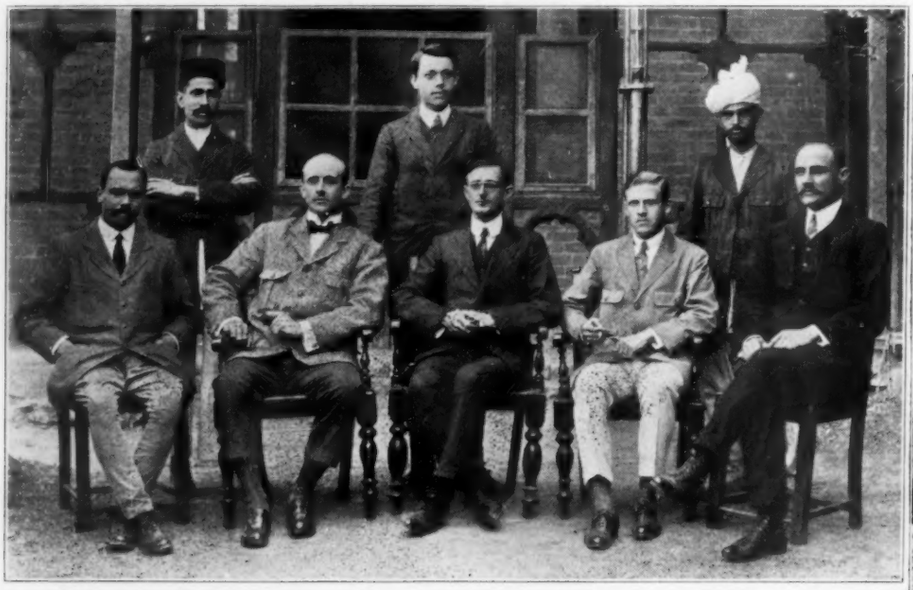
ANALYZING THE PROBLEM.

A MAN who uses his head is worth half a dozen thoughtless or "rattled" men in a pinch, judging from an item in the *Southwestern Telephone News*.

Here is a case in point: Recently a lot of plaster fell from the ceiling of the Colfax Exchange, St. Louis, into a bank of cells. A hurry call was sent to headquarters for help. The exchange employes feared that the cells were ruined. C. C. Stevens, in the office of the equipment engineer, received the call. Instead of rushing out to the scene of the accident and having the cells cleaned at considerable expense and loss of time, he quietly sat down and figured out the chemical action of the plaster on the fluid in the cells. After he had finished his analysis he decided that the plaster would not impair the usefulness of the cells, and that nothing need be done in this matter.

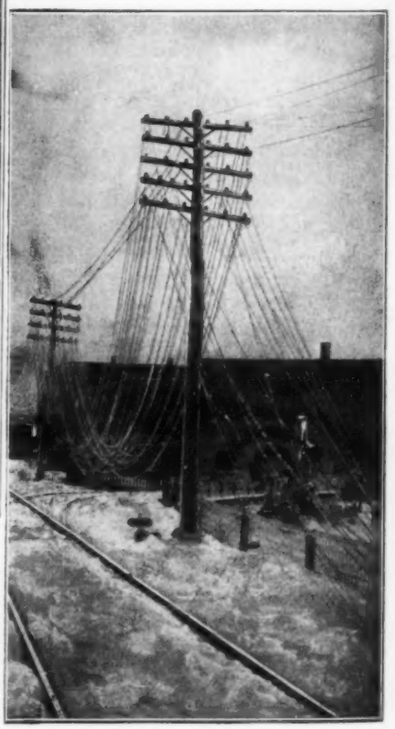
Telephone and Telegraph Building, Simla, India. The Automatic Exchange Occupies a Portion of This Structure.

Tree Telephone Used as One of the Properties in "The Tightwad," a Motion Picture of the "Beauty" Brand. The Heroine's Lover Is a Telephone Lineman, Who Has Been Forbidden the House by the Irate Father, Who Is So Tight He Will Not Permit the Installation of a Telephone on His Premises. He Is Not Aware of the Tree Telephone Installed by the Hero for the Heroine's Convenience. But One Day the Tightwad's Wife Is Taken Sick and at the Same Time Thieves Approach to Rob the Old Man of His Treasures, Hidden in the Fireplace. The Girl Obtains a Doctor and the Police in a few Moments by Means of the Tree Telephone, and the Tightwad, Converted, Installs Telephones and Other Electrical Devices All Over the Place.



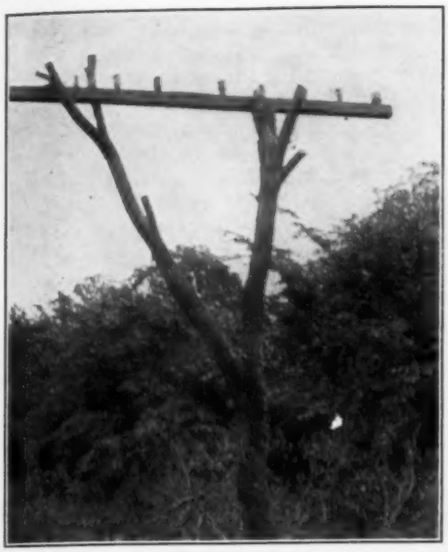
The Installing Crew and Executive and Operating Force, Simla Automatic Telephone System.

The original equipment was placed in service on March 9, 1914, and is the first automatic exchange to operate in that part of the world. The cut-over was uneventful, and from the first the equipment has rendered a service entirely satisfactory to the public and very gratifying to the government engineers who were responsible for its adoption. Simla, the summer capital of the Indian empire, is an interesting city and presents some telephone problems not generally encountered elsewhere. Located in the northwestern portion of the country, far up in the hill country, its climate is cool and offers welcome relief from the heat of the lowlands. But during the monsoon season, extending from June through September, the humidity is very great and presents serious difficulties in the operation of all electrical apparatus. Since the installation the automatic service has become still more popular, with the result that it became necessary but little more than half a year after being placed in service to increase its capacity. Another important factor in Simla's telephone problem is the great seasonal variation in the service load. As was remarked before, Simla is the summer capital of India. During the height of the season its population approximates 40,000. At other times, however, Simla is but little more than a small hill village. Its population dwindles to 15,000 or 18,000, mostly natives, its hotels are empty, its streets deserted, its telephone exchange practically idle.—Automatic Telephone.

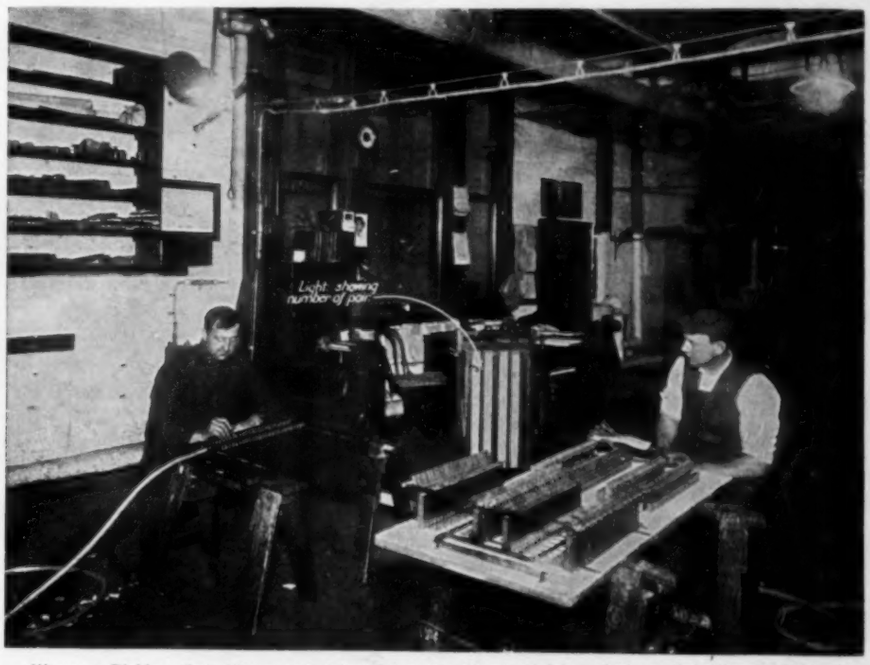


An Extreme Case of Sag Caused by Sleet Load. The Wires Not Sagged Are Copper Clad.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

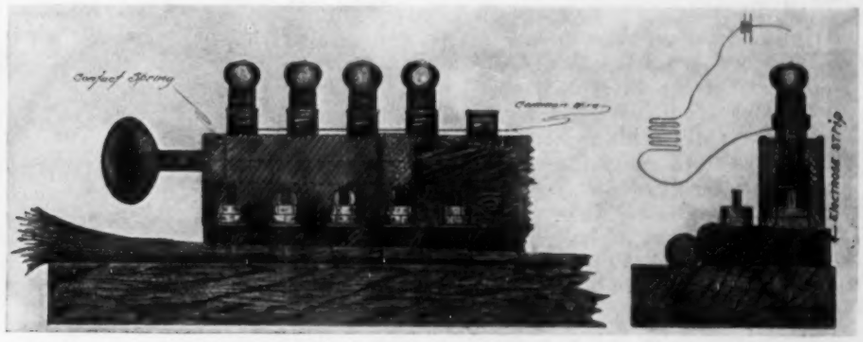


Any Old Way to Carry the Wires.—From the Southwestern Telephone News.



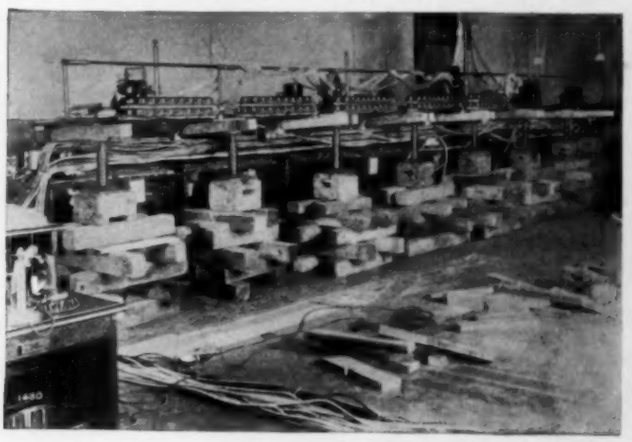
Wireman Picking Out Wires and Identifying the Numbers in a Cabinet Switchboard With the Aid of the "Silent Helper." Described by D. Berryman in the Telephone Review.

Bazaar, Kansas, Office. Six Telephones in Town and Seventy-five Rural Stations. Office Is One of the Smallest in the Missouri and Kansas Territory, Being Only Eight Feet by Twelve Feet in Size. Bazaar Is the Shipping Point for the Largest Cattle Grazing Section in Kansas.—From the Southwestern Telephone News.



With this device, which fits over the connecting blocks of the terminal, a man can board any size cabinet alone, without any other operation than touching a wire with his pick. A lamp lights, indicating the number of the wire touched and the man proceeds to place the wire in his cleat properly numbered. The lamp indicating board is placed at a convenient point where it is visible to the man testing. Another device has been perfected that can be attached to the paper insulated wires on the end of a house riser. When the splicer goes through the cables looking for his pairs, as he touches the proper wire with his pick the silent helper indicates the number.

Toll Board on Trucks Being Pivoted Around.



Back View of Board After Being Raised on Jacks.

An Unusual Piece of Work Performed at Oakland, Cal., Comprised the Moving of Two Chief Operators' Desks, Two Sections of No. 1 Recording Board and Three Sections of No. 5 Information Desk From the Third Floor to the First Floor, and the Conversion of Three Sections of No. 5 Information Desk to a General Traffic Desk, the Raising Up of Three Sections of No. 1 Toll Board Approximately Forty Feet and the Raising Up and Moving of Seven Sections of No. 1 Toll Board. All Apparatus Moved Was Working.—Western Electric News.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

Telephone System at Panama-Pacific Exposition

The designing of a telephone system for the Panama-Pacific International Exposition presented many problems. Added to the large area to be covered was the installing of a system intended only for temporary use and the necessity of keeping the expense of installation at a minimum. The department of mechanical and electrical engineering under the supervision of Guy L. Bayley as chief, has designed a system that is comprehensive in its details and entirely adequate to meet the demands placed upon it.

The exposition grounds cover an area of 625 acres and are divided into four sections as follows: Amusement concessions, exhibit buildings, state and foreign buildings, and live stock, athletic field and race track. There are 150 concessions in the concession district and 2,000 exhibitors in the 15 exhibit buildings. The executive offices of the exposition are in the California building, which also houses the exhibits from the 58 counties of the state. There are 200 buildings large and small in the state and foreign buildings section, and five in the live stock section.

The entire system of wires and cables is placed in underground conduits composed largely of fibre-wood duct. Iron conduit is used where water is near the surface. The conduits are laid in wooden troughs and packed in sand except adjacent to the manholes where concrete is used. The conduits also carry the electric light and power wires. This gives economy of space and installation. There are 150 manholes, 47,500 feet of two-inch and 376,500 feet of three-inch conduit, not including short runs of iron conduit connecting numerous small buildings with the main cable system.

In determining the number of subscribers' lines necessary, each of the four sections of the grounds and the large exhibit buildings was considered separately. The area, the number of buildings in any proposed distribution district and the types of the various exhibits were all studied closely. A system of 1,000 lines was deemed sufficient to give adequate service.

A large cable is run to the center of each section and through a cross-connection box, feeder cables branch off to other points. In the buildings, twisted paired wires supported in rings run along the trusses or under the floors. In the state and foreign building section where there are 200 buildings to be accommodated, a large cable is run into several of the larger buildings and feeder cables suffice for other points. Weatherproof wires in conduits are run to buildings where the stations are isolated. In the concession district, all buildings are connected from the rear. The entire underground plant comprises 41,000 feet of cable, 4,500 feet of which is 400-wire cable.

The switching station is located in Food Products building. The switchboard is a five-section board with fifteen positions and is of standard design. There is also a chief operator's desk and a four-position information desk. The equipment includes a storage battery plant, charging generators and ringing machines. The board is equipped with five-panel multiple and auxiliary answering jacks, 200 for incoming and 160 for outgoing calls. Thirty-two attended public pay stations are installed at convenient points, including one in each exhibit building. There are five to ten booths comprising each station.

Individual measured rate service will prevail as regards the charges for the telephones except in the case of restaurants and concessions where coin collectors will be used.

A 400-pair cable connects the system with one of the exchanges of the local company in San Francisco to handle the incoming and outgoing city calls. A special composition cable provides facilities for long distance service. All stations will handle local or long distance calls.

The registration and information bureau, which is unique with the exposition system, is available through any of the stations. Friends becoming separated can telephone their whereabouts to the bureau and be reunited in short order. Twenty word messages of any kind can be telephoned in and listed. When the party desired calls in, the message is then read to them. This message can be sent in from any of the stations on the exposition grounds or will be accepted as a "collect" message when sent in from outside stations, the party called paying the charges. Lost children can be easily located by this means.

Wisconsin Installs Observation Board

An observation board, the second of the kind in Wisconsin, has been installed as part of the equipment in the central station of the Wisconsin Telephone Company in Appleton. The other observation board in Wisconsin is a part of the equipment of the central station at Madison.

Hereafter it will no longer be necessary for the telephone company to take subscribers' words for complaints of inefficient service, because the observation board will make it possible for the company to find out first-handed if the central operators are not giving patrons the service they are entitled to. For instance, if a complaint is made by Mr. A., to the effect that service given him either locally or over long distance is not what it should be, the complaint is registered with the operator in charge of the observation board. Promptly thereafter the operator watches for calls from Mr. A., and listens when such calls are made so that she can hear everything that is said and hear, as well, whether or not the operator is giving the service the company expects of her.

Before her the observation board operator has a blank on which several dozen entries are made and which gives those in authority a complete history of every call watched. A detailed record of local and long distance service is afforded by the new observation board and those in authority are in position to check up central operators at any time. They are also in a position to determine whether complaints made by subscribers are justified or whether the fault lies with the subscriber or central operators. Another value of the new equipment lies in the fact that central operators now know that it is possible for the authorities to keep a complete check on them without their knowing anything about it. The observation board operator can cut in on any line without either central or the parties talking knowing anything about it.

We are in receipt of Vol. 1, No. 1, of *The Telegraph and Telephone Journal*, published by the General Post office of England. The date of this first number is October, 1914, and its make-up is reminiscent of the old National Telephone Company's *National Telephone Journal*. Although started apparently at a bad time, the new paper looks good and contains a great deal of interesting material.

Lillian Polsky, Agnes Carlson and Stella Braff of North Exchange, Minneapolis, of the Tri-State Telephone and Telegraph Company.

The Minneapolis Kitten Ball Team.
Top Row, Left to Right—Mickelson (Calhoun), Nelson (Calhoun), Oregon (North), Sprague (Center). Second Row—Briggs (Snelling), Gross (Center), Peterson (Calhoun), Beckren (Calhoun), Vogel (North Chief). In Front—Hydeman (Center).

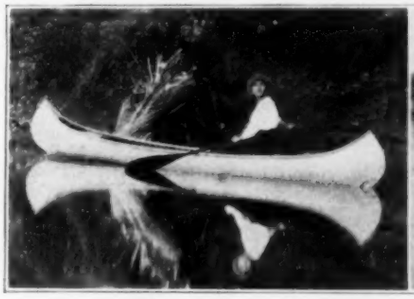
Therese Rosenberger, Martha Roth, Lena Moen, Louise Rinn, G. Vogel, Jessie Zachi and Bernice Lynne in Front of North Exchange, Minneapolis.

Stories of the Tri-State System

Told by Operators in Minneapolis and St. Paul Exchanges of the Company

The Operating Room at Main

By Miss M. O'Connell, Chief Operator at Main.



Lillian Buschel, Park Exchange Chief, St. Paul, Tri-State System. *Georgia Jackson, Supervisor at Main*

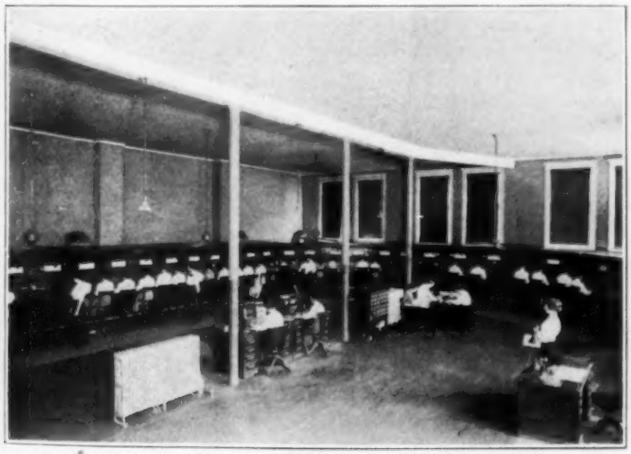
HERE is a picture of the operating room at the Main exchange of the Tri-State Telephone and Telegraph Company at St. Paul, Minn., showing switchboard, information desks, toll clerk's desk and chief operator's desk. The switchboard consists of forty local and nine "B" boards which includes recording and special operator's board.

Particularly interesting is the supervisor circuit recently installed in the Main office. The circuit is equipped with a long cord, receiver and transmitter, which is connected with a conduit arm that extends from the top of a section of the switchboard.

There are four circuits, one for each supervisor, and they are so equipped that a supervisor wishing to communicate with any supervisor on the floor can do so without leaving her own division.

The operator can also connect with the supervisor in her division by plugging in on a certain trunk, which connects with the circuit. If a supervisor is busy in one division an operator can connect with any of the other circuits that are not in use.

A very good feature of the circuit is the fact that an operator, when not able to handle a subscriber, can connect him with the supervisor who can talk to him without other supervisors hearing her, for by connecting the



Operating Room at Center Exchange, Minneapolis.

Lunchroom at Main Exchange, St. Paul.

subscriber with the circuit it cuts the other supervisors off that particular circuit, allowing the supervisor to talk to the subscriber without interruption.

Supervisors can also disconnect from the circuit and listen in on the operators' board.

Each supervisor has nine operators under her supervision.

When I became associated with the Tri-State Telephone Company it had about seventeen hundred subscribers in Main exchange, employed about twenty-five girls and had one supervisor and the chief operator, who held the position of information and chief operator owing to the fact that the company did not have enough subscribers to maintain an information clerk whose time could all be devoted to that particular work, therefore the position of chief operator included the position of information clerk as well.

I entered the telephone service as a student in the operating department, and after two weeks service was promoted to regular operator; after operating two years I was advanced to evening chief, a position I held for four years, gaining a great deal of experience. From evening chief I was appointed day chief in charge of Main exchange, which position I am holding at the present.

The Main exchange now employs one hundred girls, having nine supervisors, two information clerks and the chief operator.

Operating Room at Main Exchange, St. Paul.

When I first entered the employ of the Tri-State Telephone and Telegraph Company the entire switchboard consisted of twelve local and two trunking positions. This has grown very rapidly until at the present time the Center office alone employs over one hundred and seventy-five girls, having fifteen supervisors, three information clerks and a chief operator.

The company has a dining room in connection, where the girls get good, clean, substantial food at a minimum cost.

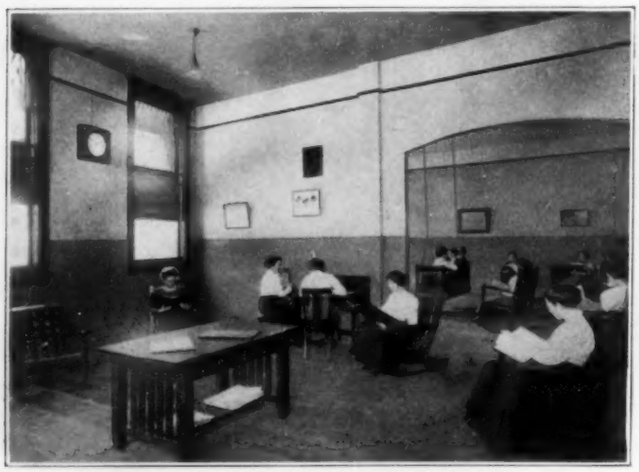
We also have rest rooms and two sun porches, screened in summer and enclosed in glass during the winter months. They are furnished with swings, comfortable chairs and couches, and well supplied with good reading matter, including the very latest books and current magazines, and in addition a branch of the public library.

Something from which the chiefs and supervisors in the Center office have derived a good deal of benefit and also pleasure are the meetings we have been having during the winter months. We meet alternate Fridays, discuss the work and exchange experiences. After the meeting light refreshments are served.

Operating Room, Minneapolis Center Exchange

By Miss Lucy Garrity, Chief Operator at Center.

THE accompanying illustration shows only a part of the switchboard, the test desk, information desk and private branch board of the Tri-State Company's Center exchange at Minneapolis. This exchange has sixty local positions and fifteen trunking positions, including "hospital board."



Rest Room at Main Exchange, St. Paul.

Calhoun Exchange at Minneapolis

By Miss Maude Ryberg, Chief Operator at Calhoun.

CALHOUN exchange consists almost entirely of residence telephones. The operating room, which is on the second floor, is bright and well ventilated, as you can see in the picture.

The switchboard consists of twenty-nine "A" boards and seven "B" boards, the "A" and "B" boards being on opposite sides of the room and equipped with the automatic ring.

There is a chief operator and information desk, the testing and clerical work being done at the chief desk. There are two information operators who answer all in-

Operating Room at Calhoun Exchange, Minneapolis.

formation calls for the Calhoun, Grove, Snelling and Harriet exchanges, also the location calls for North and Spruce.

The rest room, dining room, locker room, kitchen and terminal room are on the first floor. The rest room and dining room are made home-like and comfortable. Both rooms have large windows, which are all curtained. The rest room has two large rugs and is furnished in fumed oak, leather upholstered furniture. There are several comfortable rockers, a large davenport, a library table and a fern, which adds to the homelike appearance of the room.

The dining room is furnished with plain table and chairs. The telephone for the operators' use is also in the dining room. The best of reading matter is furnished, including the latest magazines and library books. There is a gas range in the kitchen for the use of the operators.

All these conveniences make the Calhoun exchange a very pleasant place to work in.

Operating Regulations and Instructions

By Miss Winifred Goodsmith, Traffic Department.

THERE is to be a magic change in the operating department of the Tri-State Company with the adoption of our new operating regulations and instructions. After looking anxiously for weeks and months, and for some it has been years, they are here in "flesh and blood." We know now just exactly what to do and know also that all the officers are doing the same as we. We can answer any "sticker" the people may "fire" and we dare them to " stump us." "One moment please" will do for most anything until we can think of just the correct phrase for that special case and in time the phrase itself will come immediately.

Everyone realizes that at first it is going to be hard to adopt the new methods and phrases, but any dose in small quantities loses its bitterness, and if it can be done or has been done we can do it here—that is one sure thing. When every one is pulling the same way it will be easy; for is it not true that a heavy responsibility carried by one would, if several helped, grow light for each one?

Just at this time of the year Minnesota skies seem to be the brightest and we feel sorry for any one that has to live in other states. It is so much easier to smile indoors when the weather is smiling outside. The air has a certain crispness which can't help but stimulate our working spirits and makes us all the more anxious to get at those long sought rules and put them into practice. So before very long we hope to tell of startling results in improving the Tri-State service.

Tri-State Exchange at Fair Grounds

By Miss Beth Zwickel, Supervisor at Main.

AT OUR annual Minnesota State Fair the Tri-State Telephone Company erected a small exchange equipped with a Garford board of 125 lines, two "A" and two "B" positions. Almost every exhibit on the grounds had a Tri-State telephone. There were two chief operators, each having five girls in her charge, and their hours were divided into two shifts. An average of two hundred calls were answered per hour, which means business. Every one that looked on seemed very much interested in the work, and our exchange, being located in the Main building, gave every person a chance to see how telephone work was really handled. With the exception of the switchboard our exchange was displayed in white and the operators dressed in white.

The switchboard and chief's table were enclosed in a sound-proof room, three sides of which were glass, so that the voices of the crowd did not disturb us and still the spectators could see everything we did. And you may imagine with so many eyes watching we were very careful to do the right thing. For we don't want to give any one a chance, if he complains of his service, to say "I know how well you attend to business up there. I saw the way you did at the state fair." Such a remark would be all right if it were given as a compliment, but not as a complaint.

Sometimes during fair week the heat is almost unbearable and in this air-tight room we would all suffocate but for the fact that the pay station booths as well as our glass operating room are furnished with a ventilator which blows fresh air in and sucks the bad air out. This makes a very comfortable place to work on the hottest days.

Miss Le Mere, Information Operator, and Miss O'Connell, Chief Operator at Main Exchange, St. Paul.

The St. Paul Kitten Ball Team.
Top Row—Klein (East), Kloiber (Dale), Zwickel (Main Supervisor), E. Tourville (Main), Metzinger (Main).
Second Row—Mosher (Main), M. Tourville (Main), Barfuss (Dale), Parra (Main), Chapple (Main).

Laura West, Center Supervisor; Emma Novak, Harriet Chief; Viola Peterson, Trunk Operator, and Ruth Haver, Center Supervisor, Minneapolis Division of the Tri-State System.

The Operators of Minneapolis

By Miss L. M. Gullifer, Traffic Department.

WHEN the Tri-State Telephone & Telegraph Company, formerly the Twin City Telephone Company, was incorporated in 1902, Minneapolis had a population of 247,000. At that time there was one exchange and twenty-five girls in the employ of this company Today the population of Minneapolis is over 350,000. We now have nine exchanges, namely, Center, Annex, Calhoun, North, Spruce, Grove, Snelling, Harriet and West, and employ nearly 400 girls.

Here we have close to the city the most beautiful lakes and parks in the Northwest, where our girls spend many pleasant hours.

At lake Calhoun there is a well equipped bath house with a delightful bathing beach, also sailing and canoeing.

Half a mile east of there lies Lake Harriet, which is most picturesque. Many of the girls have their own canoes here, that sport being the main attraction.

The beautiful Minnehaha Falls of international fame are only thirty minutes' ride from the city, and here many pictures are taken.

This summer many girls spent their vacations at Prescott Lodge, Prescott, Wis., and thoroughly enjoyed them, having plenty of fishing, canoeing and bathing.

Loring Park is located in the heart of the city and is both restful and artistically laid out.

In winter we have skating on all the lakes, which are kept in fine condition.

The Hippodrome has indoor skating, and its situation between Minneapolis and St. Paul makes it convenient for both cities.

Many classes are arranged by different churches and clubs where girls can take up interesting subjects, such as dressmaking, fancy work, music and literature. Some are free and others may be joined at a low cost. We have many swimming pools and gymnasium classes. With all these things in addition to their work the girls are quite busy.

The Minneapolis Baseball Team

By Miss G. L. Vogel, Chief Operator at North.

A GIRLS' baseball team cannot be called quite ordinary. At least we didn't find our team to be so.

It was a little work to arouse interest, and even after the training had begun in earnest it was hard to get the same girls out for practice. The fashions of the day do not help to make such play easy, and more than one of the hobbles had to give way, when its owner became excited.

Even though the ball (which was the regular kitten

Operating Room of the First Tri-State Exchange, April, 1902.

ball) was large, it was not always easy to hit, or catch. The girls have a pretty stiff arm when it comes to swinging a bat.

But that isn't the worst. The day after is, and that's what lost us a couple of good players. It's a little unpleasant to try to get up in the morning and find that it hurts physically as well as mentally.

There had been rumors afloat that St. Paul had been getting some fine practice. When on the day of the picnic, July 11, St. Paul told us they were going to show us how to play ball, we were not sure they wouldn't. We hadn't seen our suits until that day and were pleased with them. The St. Paul girls had made their own and they had blue bloomers and skirts with white middies, a

Main Exchange Building, St. Paul.

Tri-State emblem on one sleeve and a small St. Paul pennant on the other. Ours were the full black bloomers and the white middy blouses with a large red letter M across the front.

The game from our point was good. At any rate, some of the people in the grand stand became so excited that they came down onto the field. The players on both sides were very much interested, and both pitchers worked especially well.

At the close of the game a number of the witnesses found they hadn't any too much voice left. Those who were there can understand why.

The Minneaoplis team was very much surprised and as much delighted when the ninth and last inning finished with a score of 9 to 11. The five-pound box of candy as the prize with a lot of good cold lemonade tasted mighty fine.

The St. Paul Baseball Team

By Miss M. Tourville, Main Exchange.

ONE of the pictures represents the girls' kitten ball team of the Tri-State Telephone Company of St. Paul.

It was organized in May, the girls practicing once a week at Merriam Park, one of the branch exchanges. The girls, about ten in number, left the office at five o'clock and met the remainder at the park. After this the girls were divided into two sides and practice began in earnest, so much in earnest that they never thought of leaving the diamond till it was too dark to play; and then followed our appetizing lunch. After a pleasant chat the tired but elated girls went home looking forward to the next practice.

What was undoubtedly the most fun was the making of the suits.

A sewing machine was rented and brought up into the rest room. Each girl undertook the task of sewing her own suit during her lunch hour or her relief. The suits consisted of a middy blouse, with navy blue collar and cuffs, a pair of bloomers and a wide skirt, likewise blue.

Protected by the good old Patron St. Paul on the right arm and the Tri-State emblem on the left, the girls were ready to challenge any girls' kitten ball team in the field.

Chicago's Public Service Bureau

The Only Commission Handling Public Utility Problems for a Municipality

BY ARTHUR KNEISEL

WHILE municipal ownership and municipal regulation of public utilities have been actively discussed for some time, the city of Chicago is the first municipality to make a practical attempt at solving the problem. In May, 1914, the city council established the Department of Public Service with Montague Ferry as commissioner. This department embraces five branches or bureaus, each under the control of a supervisor appointed for ability and efficiency in his profession, as shown by a civil service examination. At present these bureaus are supervised as follows:

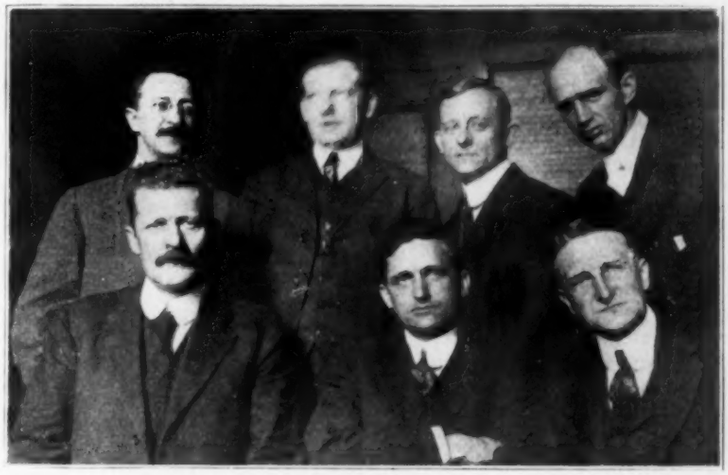
The Telephone Bureau, G. W. Cummings.

The Transportation Bureau, R. F. Kelker, Jr.

The Electric Bureau, C. E. Schutt.

The Gas Bureau, M. B. Ferguson.

The Engineering or Valuation Bureau, E. N. Fales.



Top Row, Left to Right—A. V. Scheiber, Ray O'Brien, Arthur Kneisel, H. O. Turvey. Lower Row—W. D. Wilcox, Deputy Commissioner; Montague Ferry, Commissioner; G. W. Cummings, City Telephone Supervisor. Members of the Chicago City Telephone Bureau.

An interesting paper could be written on the work accomplished by each of these but space limits this article to one and naturally the first is chosen as being most interesting to the telephone field.

The Telephone Bureau was established May 26, 1913, under Mr. Ferry as telephone commissioner. On January 1, 1914, Bert H. Peck was appointed city telephone supervisor, and on August 21, G. W. Cummings took charge of the work. The bureau has a staff of thirteen inspectors and investigators in addition to the supervisor and his assistant. The number of investigators is increased temporarily as occasion requires. The duties of the bureau are defined by ordinance as follows:

First, *Complaints:*

It shall be the duty of the telephone supervisor to receive complaints and to examine the grounds of all reasonable complaints in respect to alleged violations of any ordinance that may or hereafter be in force in the city of Chicago, authorizing any person or corporation to construct, maintain and operate a line of telephone wires in the city of Chicago or to furnish telephone service in the city of Chicago, or in respect to alleged violations of any ordinance, general or special, of the city of Chicago, relating to the furnishing of telephone service in the city of Chicago, and to take such proceedings and action in respect to such complaints for the purpose of adjusting the same and enforcing the provisions of any such ordinance or ordinances as the circumstances may warrant or require.

Under this item are such complaints as poles or guy wires, wires or other apparatus which may be a nuisance or a menace to the public. Considering the inertia to be overcome it is surprising what positive and speedy results are secured. For instance, if a property owner complains that a pole carrying the wires of several corporations is a nuisance and should be removed, he can appeal to the Department of Public Service, which is the only one common point of all public utilities in the city, and it is comparatively easy to get concerted action from the supervisors of two or more bureaus when it would be practically impossible for one complainant to get agents of all the corporations to act together in such matters.

Second, *Supervisor's Duties in Respect to Enforcing Laws, Ordinances and Resolutions:*

It shall be the duty of the telephone supervisor to enforce the provisions of all laws, and ordinances and resolutions, now or at any time hereafter in force in the city of Chicago, in respect to the apparatus, appliances, equipment, classes and kinds of service, facilities and equipment to be furnished lessees and subscribers, methods of service, operation of plant, system, wires, cables, electrical conductors and other equipment, extensions of and additions to systems and new exchanges, in the city of Chicago, of any or all persons or corporations furnishing telephone service in the city of Chicago to the city of Chicago and the inhabitants thereof, and in respect to the rates, charges, prices, tolls, or other compensation or any limitations thereupon, for each and every kind of telephone service, facilities and equipment furnished or supplied by any such person or corporation and also the basis, method, manner and means of computing, exacting, imposing, paying and collecting of such rates, charges, prices and tolls, or other compensation.

This definition refers to the general run of subscribers' complaints concerning service, telephone troubles, disputes on billing or excessive charges for moving telephones, complaints regarding private branch exchange service, etc. The nature of some complaints converts the bureau into a law expounding school to educate the public in the interpretation of city ordinances.

Third, *Supervisor's Duties in Respect to Rules and Regulations of Telephone Companies:*

It shall be the duty of the telephone supervisor to procure and keep on file in his office copies of all rules and regulations, affecting the public, of all persons or corporations furnishing telephone service in the city of Chicago to the city of Chicago and the inhabitants thereof, and if any such rule or regulation is, in the judgment of the telephone supervisor, unjust or unreasonable, and the person or corporation making or enforcing such rule or regulation shall fail or refuse to rescind such rule or regulation within ten days after written notice so to do by the telephone supervisor, said supervisor shall make a written report to the City Council in respect to such rule or regulation together with his recommendations concerning the same.

Among other investigations conducted under this

rule, one was made of complaints that a flat charge of $5.00 for moving a telephone in the same building was excessive. This resulted in a compromise with the telephone companies of the city to the effect that a subscriber be charged the actual cost of labor and material involved in the work, the entire charge not to exceed $5.00, thereby effecting a great saving annually to telephone users.

Extensive investigations are conducted under the fourth definition of duties of the bureau which reads:

Fourth, *Supervisors to Collect and Compile Information and Data:*

It shall be the duty of said telephone supervisor to cause to be collected and compiled under his supervision, and to keep on file in his office, properly indexed, information and data relating to matters connected with the furnishing of telephone service in the city of Chicago and in other cities in so far as such information and data may be of material assistance to the City Council or any committee thereof or any officer of the city of Chicago or any department of the municipal government of the city of Chicago, in considering or dealing with the question of telephone service in the city of Chicago. The public shall, subject to such reasonable rules and regulations as may be prescribed by said supervisor, have access to and may consult all files and documents of said telephone bureau.

Among these are telephone rates in large cities in various parts of the world, inventions in telephony and progress in the manufacturing field, operating rules and regulations, traffic data on various types of apparatus and other items of general interest to telephone users. Under this item, the bureau is constantly gathering information and data which prior to its establishment were gathered by consulting engineers who were engaged from time to time at high fees. The results obtained by a corps of men constantly in touch with all phases of a situation are naturally much more satisfactory than those obtained by men asigned to the investigation of a certain question. Under the last-mentioned circumstances the relation between the question under investigation and the entire field cannot receive the same detailed attention as under the former.

Monthly and annual reports must be submitted to the mayor and council as defined in item 4.

Fifth, *Monthly and Annual Reports:*

Said telephone supervisor shall, as soon as practicable after the first day of each calendar month, prepare and submit to the City Council a report of the transactions of his office during the preceding month with such other information and recommendations as he may deem necessary or proper, and as soon as practicable after the first day of January of each year said supervisor shall prepare and submit to the City Council a report of the transactions of his office during the preceding year with such information and recommendations as he may deem necessary or proper.

These reports are compiled with great care after thorough research and are similar to those of a corporation. In fact, there is a close analogy in the organization of the city in this work to that of a large corporation, the mayor representing the president, the council representing the board of directors, the Committee on Gas, Oil and Elecricity (which has supervision over the Department of Public Service) representing the operating committee of the board of directors, and the department with the commissioner at its head representing the workers who must show results to the directors. The public itself may be compared to the stockholders of a corporation. The analogy is not perfect, for in municipal affairs, the individual stockholder has the opportunity of exercising his choice in the directorate to a more liberal extent than in a corporation where his influence is measured entirely by his holdings. If the directors (aldermen) do not show results satisfactory to the majority of stockholders (voters) irrespective of their holdings (wealth) they are almost certain of defeat at the next election. I mention these facts in detail to point out the fallacy of the idea which prevails in the minds of many, that municipal departments exist only for the purposes of furnishing means for political patronage. It may be true that positions not under civil service control are likely to be filled by men having political affiliations, but this does not necessarily indicate incompetency to fill the position. Since the council must show results to the people it is naturally careful in its choice of department heads and since these must show results in the council, they will be equally careful in the choice or acceptance of their assistants.

At no time in his connections with corporations has the writer found a keener competition between workers than exists in municipal departments. The civil service man realizes that if inefficiency can be proved against him he must go, for there are other eligibles on the waiting list ready to do the work, and the political appointee realizes that a complaint from his superior to his political patron is likely to cause his removal for a more competent political appointee.

On the whole, a municipality gets much more efficient results in its departments than that for which it receives credit.

At the head of the Chicago Department of Public Service is Commissioner Montague Ferry, a graduate of Massachusetts Institute of Technology and of Yale, who has had a broad experience in the engineering field in general and in the telephone field in particular, having been connected with the well-known independent engineering firm of McMeen & Miller, the New York Telephone Company, the Chicago Telephone Company, the Illinois Tunnel Company, the San Francisco Home Telephone Company and the Quincy (Ill.) Home Telephone Company. Mr. Ferry has had about twelve years' experience in directing the construction and engineering of public utilities.

G. W. Cummings is in direct charge of the Telephone Bureau as city telephone supervisor. His experience with both independent and Bell companies has given him exceptional training in technical matters and eight years wrestling with local telephone problems of Chicago has fitted him with a knowledge of local conditions, such as would be difficult to duplicate.

Mr. Cummings is assisted by the writer who, as assistant supervisor, has charge of special studies; H. O. Turvey, A. V. Scheiber and Ray O'Brien, each highly trained in the particular branch of the work to be accomplished by him, and ten inspectors and investigators.

The bureau has on its staff at the present time specialists on manual telephony and local conditions, on patent matters, on semi-automatic work, on the local automatic system, on cable work, and men trained to expert efficiency in investigating telephone subscribers' instrument, line and service complaints.

In order to keep all members of the bureau in touch with the latest developments of local interest affecting the work, a school is being conducted by the city telephone supervisor, which is not only a school in telephone work but also in diplomacy and legal matters, such as the interpretation of ordinances. A secondary result of this school is the development of team spirit which spells additional efficiency for the benefit of the public, which the department strives to serve.

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SCHOLZ

AT the convention of international telephone and telegraph engineers in Berne, Switzerland, this year, various interesting points were discussed and among them the problem of automatic telephone systems with special reference to the smaller group operation. There were two points especially that received much consideration: 1. To what extent is the introduction of the full automatic telephone system to be recommended for telephone service, and what advantages are offered in regard to economy and service? 2. How can telephone systems be established having a low rate per call and what system is best for large city and suburban service?

The political-economical merit of the telephone lies in the fact that it is being introduced more generally each year, and that service is brought not only to the larger subscriber, but also to the small subscriber who does not use the telephone to an excessive degree per annum. This small subscriber service, whose statistics show that the majority of connections made for this type does not exceed 600 calls per year, is of vast importance, and there is no question but that the ratio between the total number of subscribers and the number of small-number-call subscribers will grow each year. The popularization of the telephone is increasing in Europe in all the countries, and has a ratio at present somewhat as follows per 100 capita: In Germany 4 to 6 telephones; in Austria-Hungary 2 to 3; in Italy 1 to 2; in France 1 to 3; in England 2 to 3; in Switzerland 5 to 6 telephones.

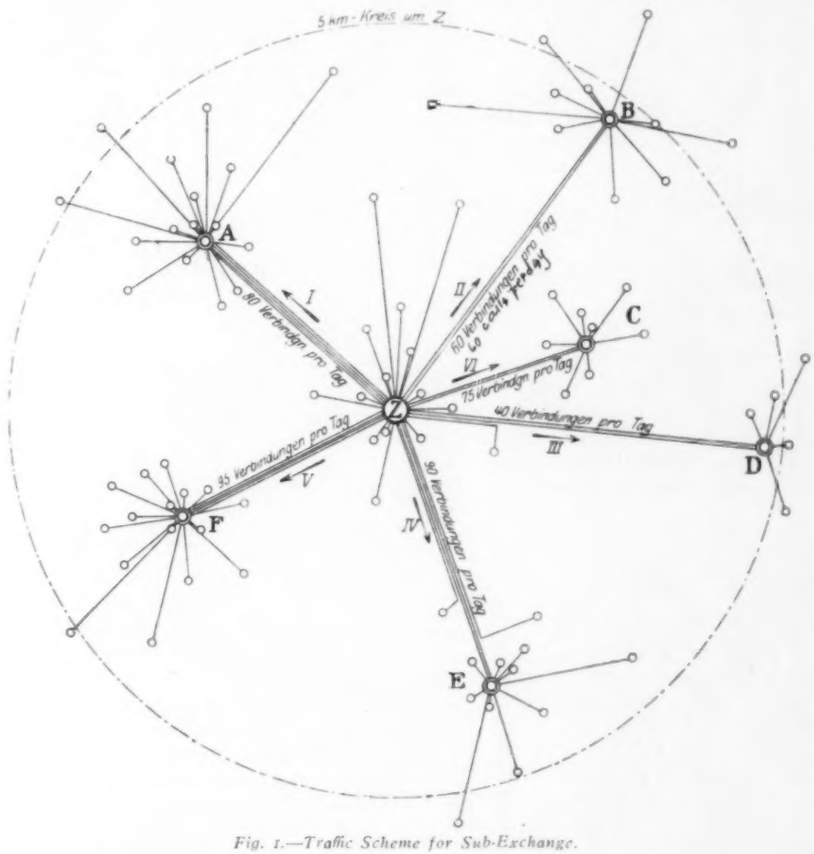


Fig. 1.—Traffic Scheme for Sub-Exchange.

When we view the comparative technical development of the telephone we will find, however, that it has not kept step with the increasing popularity of the telephone, a statement which will need a short explanation. While the effort has been to spread the use of the telephone by means of advertising campaigns and other means among the people in general, the telephone equipment itself, while on a high pinnacle of mechanical efficiency, has not decreased in cost per instrument set, but rather increased. In other words, the telephone equipment of the subscriber making only 600 calls per year has to be the same practically as that of the subscriber making 20,000 calls per year. This is especially clear where the telephone local call rate is charged to distances of three miles overhead lines. The ratio between cost of installation, on the average of $175 per telephone station, and the rate charged per call or per subscriber is out of all proportion. Either the charge has to be too high and then the telephone will be handicapped in its campaign for popularity, or else if the charge is lowered, the economic factor will place a loss in the columns of the telephone company, which is not fair either. It is worth noting that almost two-thirds of the cost per telephone set goes to the aerial conductors and equipment. Even the American system of party lines, which has found its way to Europe, does not help solve the problem to any appreciable extent. The very fact that this party line system cannot be looked upon as a perfect, full-value means of communication, where privacy is required, but rather as a means whereby the deficit in income is reduced by special rate concessions to subscribers, shows that it does not help solve the problem. There is a great difference between actions whereby the economy of a system is increased by adapting the operating means to the requirements without reducing its efficiency, or where it is, so to speak, "denatured" so that it may be sold with a slightly greater profit to a larger number of subscribers. There have been numerous attempts made to reduce the objections to the party system and eliminate them entirely, if possible. Inventions have been patented which were to eliminate the possibility of a third party interfering with the two members of the party line talking, or listening to them. Other systems attempted to interrupt the conversations automatically after a certain lapse of time, so that the evil of a subscriber using the telephone for an excessively long

time should be eliminated. A line having these two innovations was used in Austria, but even then it did not give the same satisfaction that a line gives where the subscriber has his own private wire. On either improved or older type of party line, the party line subscriber still pays a lower rate for the service in view of the fact that he shares his line with others.

In attempting to solve this problem attention must be called first to the so-called "sub-exchange system" of the smallest type, in which small groups of 10 subscribers each are united in a standard group switchboard for man-

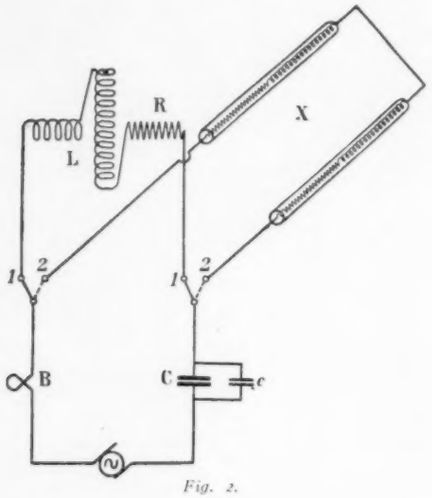


Fig. 2.

ual, semi-automatic or full automatic operation. They are interconnected and connected to the central exchange by means of two trunk wires. Chronographic tests made with such a system show that some 100 connections can be made every two minutes, without hampering traffic the least. The Bavarian state telegraph and telephone

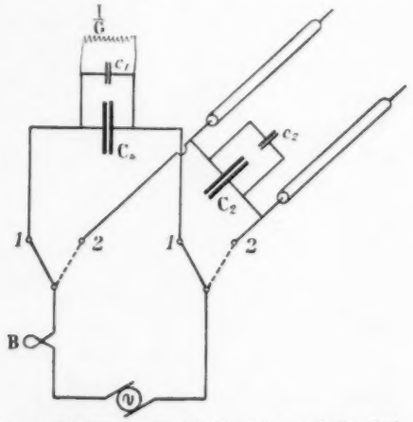


Fig. 3.—Measurement of Capacity and Insulation.

department, recognizing the value of this system, equipped a number of cities, towns and country districts with these sub-exchanges. In considering the financial end of the system, the full automatic system has been considered, as this system with its small selector switch and automatic equipment takes less room at the central exchange than other systems. Granting that the cost as far as telephone equipment proper is about the same, the saving would come in the overhead equipment. The cost per connection for this system would be about $175 \times \frac{2}{3} = \$112$, and as we have to figure on about 1.7 km. double wire per connection, we would have $65 per km. (.6 mile). This value represents the average value for European conditions. If we allow for the connection between the 10 subscribers and the sub-exchange 15 per cent of the wire length between group and main exchange, we would have about 250 meters (825 feet), and for the 10 subscribers we would have a total of about 6 km. (3.6 miles) wire as against the 17 km. (10.2 miles) double wire needed for 10 single connections of the other type. The difference in installation costs will be about $700 or $70 per connection, a saving of 40 per cent.

Relating these values to the European system of small subscribers, basing arguments on present conditions, this would mean a total investment of some one hundred million dollars, which is the amount invested in this type of service at the present, part of which is always lying idle.

To illustrate this point an example may be given: Fig. 1 shows the diagramatic scheme of a telephone system, in which *Z* is the nearest large exchange, manual, semi-automatic or automatic. The lines *Z-A*, *Z-B*, *Z-C*, *Z-D*, *Z-E*, and *Z-F* do not permit an increase of traffic on

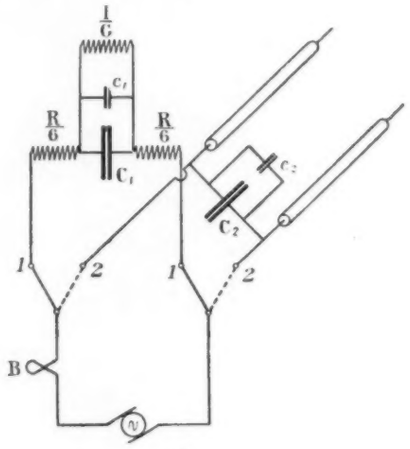


Fig. 4.

economic grounds in either of the outlying districts under the old system.

If the line is to be expanded, the wires would have to be connected in cables, or at any rate the poles and wires rebuilt to meet new conditions. In order to permit expansion at a saving of copper for wire, the system is to be reorganized with the sub-exchange operation in mind. This may be done if small sub-exchanges are built in at points *A*, *B*, *C*, etc. For the connection of the 16 subscribers in *A* and *F*, there would be necessary two party switches each of the type *G* 10/11, with each 2x2 wires, while for the other points, *B*, *C*, *D*, *E*, only one group switch of the same type is needed. The following table shows the difference in km. of double wire saved under the new scheme:

REQUIREMENT OF WIRE FOR BOTH SYSTEMS.

With One Exchange and No Sub Exchanges.		*With One Exchange and Six Sub-Exchanges.*	
Direction.	Km. Wire.	Direction.	Km. Wire.
I.	$3.25 \times 16 = 52.0$	I.	$3.25 \times 4 = 13.0$
II.	$4.5 \times 10 = 45.0$	II.	$4.5 \times 2 = 9.0$
VI.	$2.5 \times 8 = 20.0$	VI.	$2.5 \times 2 = 5.0$
III.	$4.5 \times 5 = 22.5$	III.	$4.5 \times 2 = 9.0$
IV.	$3.75 \times 10 = 37.5$	IV.	$3.75 \times 2 = 7.5$
V.	$3.0 \times 16 = 48.0$	V.	$3.0 \times 4 = 12.0$
Total	225.0	Total	55.5

If we add about 20 per cent wire for future growth

in both systems we would have a total saving in wire of the new over the old system of some 200 km. (120 miles) double wire, which, translated into cash, would mean installation costs less by $2,000 and the recovery of $1,500 through less use of about 170 km. old wire, which is not needed and can be used elsewhere. The total saving would be about $3,000 to $4,000, which would be sufficient to transform the system into the automatic system for the subscribers in the districts affected.

Example 2.—The second example relates to the use of this system in city limits. In order to allow for future building development and relieve the rush on the present system, it would be necessary to take sets of 10 subscribers at present connected to the exchange and connect them to one of the sub-exchanges mentioned. The financial effect of this scheme would be the following: Through the erection of each sub-exchange in the district to be served a reserve of 24 km. wire is obtained, which represents a saving of about $1,500. To this must be added a saving of 10 connection units at the central exchange with a value of about $150. We have to deduct from the total the cost for installation of the new sub-switches, which may be figured at $250, and will give per small group a saving of $1,400 for installation costs and with 8 per cent interest and depreciation a general saving of $110. These two examples illustrate the chief advantages of the small sub-exchange or sub-switchboard traffic, namely, saving in wire material, and in the case of automatic service, saving in operators' wages; and, second, the saving in wire material permits greater expansion in the more outlying rural districts at less of a risk and investment on the part of the telephone company.

So far we have only viewed the technical end of the problem, and we will now have to turn to the financial end as relates to the subscribers' charges. In this question of rate policy it is very interesting for us to note the stand taken by the state department, and to compare it to the stand that would be taken by the private corporation. 1. For all telephone sets lying within the radius of 5 km. of a central city exchange the subscribers' charges range between $75 and $375, depending on the size of the equipment and the traffic. 2. In the smaller city and town districts these charges are less, ranging from $20 to $40, although for rural traffic the charges are higher. 3. Special equipment, like switchboards, party-line switchboards, and similar details are given to the subscribers at rates which are out of all proportions with their cost and mean a direct loss to the state. These phenomena are the results of state policy, which, on the whole, attempts to keep a commercial ratio betwen cost and charges, but is in the matter of subscribers' rates guided by the political-economical standpoint rather than the business standpoint. The more this is the case, however, the less can telephone technique exert an influence on the rates. With state ownership it is not the standpoint of telephone technique that influences the rates, but rather the interests of the masses of the people. If it were not so, there would be great hardships for some types of subscribers. If the rates were based on the cost of instruments, the cities would have a monopoly on the use of the telephone and the rural districts would practically go without it. In adjusting telephone rates to the use of the improved sub-exchange system, we must take care not to take the view that a direct result will be an abnormal lowering of telephone rates just because the installation costs are lower. It would be preposterous to expect, and this is often done by the public, that a reduction in installation costs is to be followed by a lopping off of about $12 per subscriber charges. It may be expected, however, that the improvements in technical equipment be either brought to benefit the majority of people, or else that the improvements be made to intensify the advantages of as large a number of subscribers as possible, if the first case is not possible. In the first case there would probably be no great influence of technology on the rate policy. Automatic telephony, for example, promises to have a great influence on the operating costs of telephone plants. But automatic telephony comes at a time when the central microphone battery system has been introduced in nearly all up-to-date exchanges, and where the manual equipment is still young and in perfect condition, and where the displacement of that system by the automatic system would mean the loss of the present equipment. The eventual gain through lower operating costs would not be felt by the telephone companies until many years after

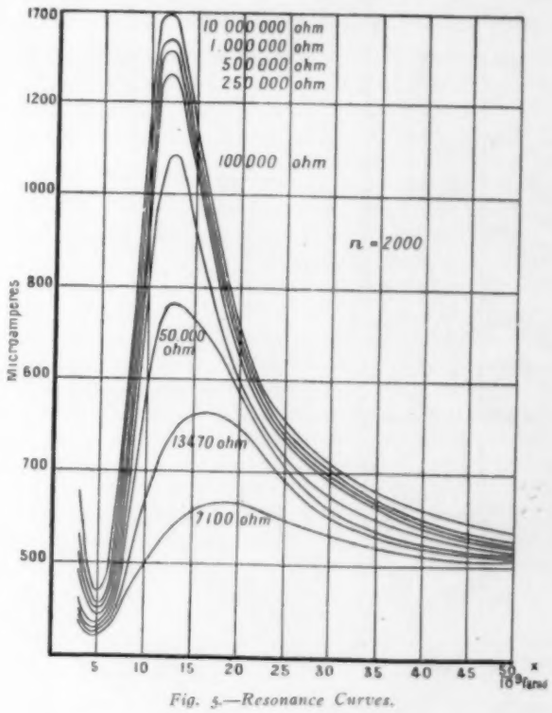


Fig. 5.—Resonance Curves.

their installation. Perhaps a decade or more will pass before automatic telephony will come to be used on a large scale, for then the depreciation in the present equipment will be so small that it can be safely discarded without abnormal losses for the most modern system. Different is the case when the technical improvement in lines can be brought to a certain definite type of subscribers. In this direction the publicity policy of the telephone companies or state departments can take either of two directions: (1) Either a special telephone equipment worked out for these subscribers is introduced and offered to them at favorable rates, the mass bringing in the profits, or (2) the regular full type outfit is offered the subscriber with special contract conditions which will have points in favor for both subscriber and company. The first way is found in the party line system; the second road has been opened by the automatic system. If the subscriber chooses No. 1, he can have a telephone at lower rates, provided he does not exceed a certain number of

calls, and takes into the bargain the disadvantages common to the party line. No. 2 is offered by the automatic system in the shape of the sub-exchange selector switches. The subscriber pays a lower toll, but does not suffer in service, and the difference in cost is due to the fact that one of the sub-selector switches can be placed in the cellar of any building and the wire saving over the other party or other systems is great enough to permit special rates. More so since there will be a greater number that will install the telephone.

We come now to a problem which so far has been looked at from the constructive-technical side and which is now transferred to the administrative-technical side. The fluctuation in connecting and disconnecting of telephone instruments is a point which lacks stability and offers food for reflection. If a certain exchange has about an increase of 1,000 subscribers within a certain period of time, we will also find a decrease of some 800 to 1,000 old connections cut off, so that the increase is eliminated by the decrease. The solution offered is the one which would give the subscribers of the automatic

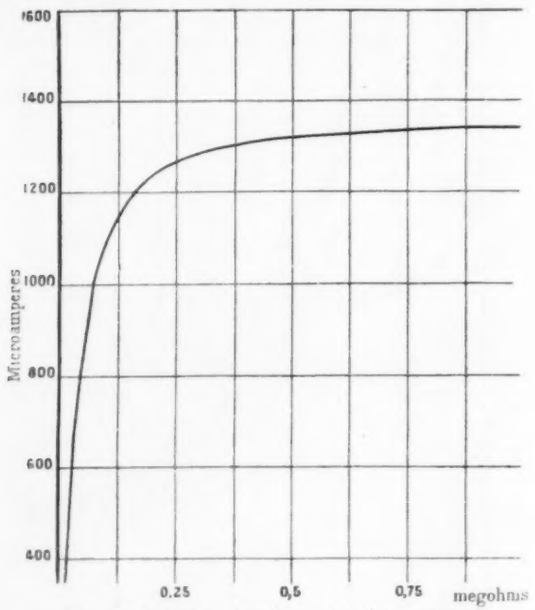


Fig. 6.—Insulation Readings of Galvanometer.

sub-exchange system special rates, but binding them to special contract conditions which will prevent this uneconomical fluctuation. Under the present system each subscriber pays for his own telephone and has the privilege as an individual of a connection at any time. The sub-exchange system might let contracts in such a way that the subscriber does not pay for the telephone as an individual unit apparatus, but hires at least three connections of the ten-group, which will permit him to increase the minimum time allowed per call by three. A unit of three would have to be in one house as well, and the owner of the triple unit would be considered by the telephone department as responsible to the department as owner of the set, and he would be held to pay the minimum rate for the triple unit. This will give greater stability to the number of subscribers and the exchange. It stands to reason that only those will hire the telephone in the form of triple units who have a certain use for it. They guarantee a rate which will not lead to losses to the telephone company or department. There will be avoided the installation of telephones for those who have only a passing use and where the costs of installation are greater than the tolls received from them within the short period of time that they use the telephones. On the other hand, the rate for the three units will be lower than the rate for the individual telephone line, which is possible through the saving in material discussed before. The double purpose will then have been met. The lower rate will attract stable subscribers, who will have all the advantages of an individual line with longer duration of calls per set, and the company will not be forced to install telephones for those who are floating subscribers and a direct loss, as the requirement of a triple unit will deter them from requesting connections.

If we consider the saving in installation costs per subscriber for the party line and the direct wire, we will find that it amounts to about $5 per telephone, which is the same for the sub-exchange system here discussed. The difference between the party-line system and the sub-exchange system is this, however, that in the former the consent of the subscriber is required, owing to the disadvantages mentioned before, while with the other that consent is not necessary. Moreover, the saving in the former case will be lost again in the considerable reduction in telephone rate that has to be made, while in the latter case this reduction will be offset by the triple unit requirement outlined. The differences in rates between direct wire and party-line wires are considerable. In Copenhagen the difference is $7.50 per telephone; in Austria it ranges from $15 to $20. It may be said, however, that the lower rate does not lead to losses, as a greater number of subscribers is won than would be the case with the higher direct-wire rate alone. The difference between the party-line system and the direct-line system is somewhere near 50 per cent. In Germany the lowest direct wire is $27.50, of which amount $22.50 goes for the standard rate charge, and $5.00 for the toll charges for the 400 calls permitted. The rates for the party line or the small subscriber would have to be about $13.75. It is out of the question to apply the minimum rate to all the subscribers on one of the sub-exchanges proposed. for the very fact of maximum calls allowed for these small subscribers, 1,000 per year per telephone, would not permit this. If we allowed all of the ten subscribers per group switchboard to have the minimum rate, we would allow only 500 calls per year, which would mean only 50 per cent of the capacity of the sub-exchanges being used. Practically only four such small subscribers' units will be permitted per sub-exchange, which would mean that the capacity is used only to 80 per cent of its full value.

The financial advantage of the group system with automatic sub-exchanges over the party-line system is clear enough. The profit derived from the formation of such a small group, about $50, can be expanded to four subscribers' telephones, and is sufficient to justify the reduction of $12 each, which is supposed to be allowed for these telephones, and which is met by the lower cost of installation. That which is possible in the party-line system only by means of a rate policy balancing the smaller rates of these party-line subscribers by the higher rates of the large subscribers, is here possible through a saving in technical equipment, i. e., an actual saving, since the wires and exchange are used to a larger extent than is the case in the party system. Moreover, the disadvantages of the party line are absent. The rate reductions possible through the decentralization of equipment and the special triple unit contracts are only possible, of course, in larger cities, for it is only here that the require-

ments of at least three units per house can be met. To leave this requirement would mean, however, wholesale desertion by full rate subscribers to the 50 per cent lower rate with a falling off of income and a financial loss. The question is raised what advantages the rural communities get from the decentralization and arrangement in small sub-exchange groups of ten. For Germany the answer lies in the fact that the rates have outstripped the technical development, in that a rural telephone distant 5 km. from the nearest exchange, with double line. can be had as low as $20 per annum, and that the technical costs of installation alone are more than double that amount. It is, therefore, the business of the engineer here to regulate the operating coefficient of such systems, i. e., the ratio between expense and income per apparatus so as to obtain a better factor. The automatic system will be able to meet this demand with the aid of the sub-exchange. Only one double trunk line will be needed between the larger exchange and the individual sub-exchange and the radius of communication will be extended considerably, as the initial costs will be lower, which will permit better rates and will be an impetus to a greater use of the telephone in rural districts. The next installment will take up the technical and practical traffic end of the problem.—*Elektrotech. Zeit.*

MEASUREMENTS OF CONSTANTS ON TELEPHONE LINES.

BELA GATI, chief engineer of the department of telegraphy and telephony in Austria-Hungary, has written a very interesting article on the measurement of the resistance and self-induction in telephones lines, which is here given in full and is taken from the *Annales de Postes et Telegraphie,* 1914.

If a circuit is short, we may admit that when it is short circuited it has the same effect as a resistance possessing a self-induction. The principle is indicated in Fig. 2. X represents the circuit to be measured; R the resistance box; L the standard of self-induction, C a changeable capacity connected in parallel with an air condenser c, which allows exact adjustment; B represents the wire to complete measurement.

In the position *2-2* of the commutator, the capacities C and c are adjusted so that we obtain resonance, which will be the case when the deviation of the galvanometer is at its maximum. If we now pass to the position *1-1* of the commutator, without changing the capacities C and c, we reëstablish resonance by changing the induction L; it is obvious that this self-inductance will then be equal to that of the circuit. The standards of self-induction being without iron, present on the whole less loss than the circuit, and the galvanometer at the momoment of resonance will show in the second case a greater deviation than it did when we made the first measurement. But if we connect in series with L a section of the variable resistance R in such a way that the deviations in the positions *1-1* and *2-2* remain the same, then we can say that the circuit measured is equivalent to the sum of R and L. In my opinion, this method is the only one which permits us to determine as rapidly and as simply without long calculation the effective resistance and the self-induction of a circuit. Of course, if we have a cable with low self-inductance, this value will be very small, and the measurements will be difficult to make. If we have a long cable, it is impossible to neglect the capacity and the preceding measurement will not give the self-induction any more. If the insulation is good, the measure of its resistance will not give unsatisfactory results. It is possible to control the exactness of the measurements in a very simple manner: We make the measurements with the length l and then with the length nl, and the values should then be for L and R n-times as great. If the cable is not short enough, we estimate the differences due to the effect of the capacity and the insulation. The self-induction of a cable with strong self-induction varies with the intensity of the current and it is possible by similar measurements to find this intensity. On the other hand, the alternators always furnish an electromotive force possessing some harmonics, but with the resonance method we will always obtain a simple sinusoidal current. Shunting of the galvanometer should be avoided by all means, as this diminishes the sensitiveness of the measurements. In cases where one is forced to shunt, due to the magnitude of the current to be measured, one proceeds differently by the removal of the zero. We can, as a matter of fact, bring back the galvanometer needle to zero by compensating the variation of the resistance of B by use of the bridge in which it is connected.

II. *Measuring the Capacity and the Insulation.* The principle of the method is shown in Fig. 3 (circuit short). In the position *11* we regulate the condensers C_1 and c_1 for resonance, and in the position *22*, we do the same for C_2 and c_2, and the capacity of the circuit will then be $(C_1+c_1)-(C_2+c_2)$. But as the losses in the circuit are considerable, although they are negligible for good standand condensers, we will still have a deviation of the galvanometer, which is smaller for the postion *22* than for the position *11*. In order to make these two deviations equal, we will add in shunt to (C_1+c_1) a changeable dielectric resistance, which will be made up of a solution of cadmium iodide in amyl alcohol. This resistance is easily made and will give direct current. The shunt resistance should not be obtained by the aid of a metallic resistance without self-inductance, as it would be too great. From the theoretical standpoint there are some objections to this type of measurement, for we cannot assume the capacity to be concentrated at one point and the circuit without resistance. To take account of this fact, the circuit having a resistance R, it is necessary to add to each side of the capacity (C_1+c_1) some resistance, equal to R/6. (Fig. 3.) This is easily shown.

The impedance of a circuit of the length *1* whose terminal is insulated is according to the usual equations:

$$Z_0 = Z \cot. \ (Al).$$

In this expression: $Z=\sqrt{\frac{\rho+i\omega\lambda}{\sigma+i\omega\gamma}}$ and $A=\sqrt{(\rho+i\omega\lambda)\ (\sigma+i\omega\gamma)}$. If al is very small (from 0.1 to 0.5), we have: Cot. $al=\frac{1}{al}+\frac{al}{3}$, which allows us to write:

$$R \text{ open} = \frac{R}{3} + \frac{1}{G} \qquad (2)$$

R being the total resistance of the circuit and $\frac{1}{G}$ the insulation of the circuit, which shows the assumption to have been true. If the circuit is very short, the effect of $\frac{R}{3}$ on the intensity of the current is negligible. I have also found that it is possible to neglect the influence of the loss in measuring with direct current. Fig. 5 represents resonance curves obtained with the capacities (C_1+c_1) connected in parallel with dielectric resistances of 10Ω, 1Ω, 0.25Ω, 0.1Ω, 0.05Ω, etc. The curve repre-

sented in Fig. 6 gives the maximum deviation of the galvanometer in function of insulation. It constitutes a sort of standard measurement, and allows us to deduce and estimate the insulation from a single reading of the maximum deviation. The measuring method described before has to be modified if the capacity of the circuit to be measured is greater than that which gives the resonance. It is necessary in that case to connect (C_2+c_2) in series with the cable and not connect in parallel.

All the measurements here described are simple measurements of substitution, which are developed in such a manner that it is possible to have telephone measurements made by good, intelligent workmen, whereas up to the present these measurements had to be made by engineers and scientists. It would be desirable that this method be taught to as many people as possible, as in this manner a great many faults and errors in telephone work can be avoided.

Complete Telephone Communication for Trains

Experts state it will be only a short time until the passenger on a Pullman car can telephone to the dining car ahead and order his meal in advance.

The experimental engineer of one of the large western railroads has developed an apparatus whereby a complete system of communication will soon be installed on overland trains. With this system it will be possible to talk to a moving train 100 miles away from a station, it is said. The train can talk back to a station, or the passengers can talk from car to car while the train is running at any speed.

It is claimed that by investigation and experimentation, the mistakes that might be made in trying to put an ordinary ship wireless apparatus on a train have been avoided. Storage batteries will not have to be depended upon, because the electricity used on trains is supplied by a generator in the baggage car.

One big advantage will be that an operator will be able to reach a whole right of way at any time whether the wires are down or not, and it will be possible to talk to a passenger train at any time, whether the train is in motion or at a standstill. It is said that the cost of equipping a train will be only nominal, and the system should prove very popular.

Chicago League Plans Automatic Inquiry

The Penny Phone League, which is working for improved telephone service at reduced rates, has presented a petition to the Chicago City Council suggesting procedure in the proposed investigation of the automatic telephone company.

The league wants the inquiry conducted by a committee composed of two aldermen, a reputable accountant, a woman representative to be named by the organized women's bodies and a representative to be named by the Chicago Federation of Labor.

The proposed investigation is to decide whether the automatic company has complied with the provision of the ordinance requiring 20,000 bona fide subscribers. Failing in that, forfeiture of the property is provided by the ordinance.

The league is fighting a possible merger of the Bell telephone interests and the automatic company, and is urging a referendum municipal ownership of the automatic plant.

American Telephone Company Files Report

The annual report of the American Telephone and Telegraph Company for the fiscal year ended June 30, as filed with the Massachusetts Public Service Commission, is as follows:

	1914.	1913.	1912.
Gross	$12,098,580	$20,116,920	$18,534,249
Operating expenses	10,880,285	10,005,075	8,864,404
Net	1,218,295	10,111,832	9,669,845
Other income	40,981,667	31,182,189	26,462,222
Total net	42,199,962	41,294,021	36,132,067
Charges	9,396,788	8,082,424	6,621,100
Surplus	32,803,173	33,211,597	29,510,967
Dividends	27,568,644	27,050,934	24,035,613
Total surplus	5,234,529	6,160,663	5,475,354

General balance sheet as of June 30, 1914, compares:

	1914.	1913.	1912.
ASSETS.			
Exchange contracts	$ 68,165	$ 66,666	$ 69,001
Toll construction	47,738,733	46,856,463	45,397,682
Construction in process	634,646	1,141,533	1,526,382
Real estate represented	385,416	424,090	2,092,620
Real estate not required	507,430	507,359	507,359
Office furniture, fixtures	163,422	157,927	169,404
Tools, vehicles	447,420	433,208	124,831
Telephones	14,562,510	13,789,819	12,890,528
Sec other cos	433,701,066	450,440,099	400,624,402
Cur assets	144,307,771	125,952,014	110,787,865
Disc, &c			1,845,000
Total	$642,520,582	$639,769,182	$574,190,060
LIABILITIES.			
Capital stock	$344,672,300	$344,516,500	$332,144,304
Bonded debt	163,518,000	161,041,315	96,113,000
Current liabilities	34,321,116	27,257,087	44,096,174
Accrued liabilities	2,123,489	1,589,742	1,065,352
Reserve funds	31,656,654	41,940,246	41,130,785
P. & L. surplus	66,229,022	63,424,290	59,640,443
Total	$642,520,582	$639,769,182	$574,190,060

Miscellaneous income was derived from the following sources:

	1914.	1913.	1912.
Real estate revenue	$ 29,387	$ 51,363	$ 170,982
Divers and other cos	25,920,488	25,912,751	21,931,575
Interest bonds, notes	6,080,117	5,199,193	4,355,413
Miscellaneous income	59,477	18,881	4,252
Revenue	8,892,297	8,346,158	
Total	$40,981,667	$39,528,348	$26,462,222

Statements on Latin-American Situation

That Latin-American countries are looking to the United States for the capital and the market for their products which they formerly found in Europe is emphasized in "Statement on the Latin-American Trade Situation," a pamphlet just issued by the Bureau of Foreign and Domestic Commerce of the Department of Commerce, giving the addresses made by representatives of Latin-American countries at a conference with American business men recently held in Washington. The pamphlet, issued as Miscellaneous Series No. 18, contains the statements made by the ministers from Bolivia, Uruguay, Peru and Cuba to the United States, the consuls-general of Costa Rica and Colombia in New York, the minister from Ecuador to England, and others, besides the opening remarks of Secretary of State William J. Bryan, and a statement by Secretary of Commerce William C. Redfield. Many obstacles to the development of Latin-American trade with the United States were commented on, notably the matter of credits and that of a proper understanding of the Latin-American way of doing business on the part of business men in the United States. The pamphlet is for sale by the superintendent of documents, government printing office, Washington, for five cents.

A wireless telephone service in Japan is shortly to be established between Kamishima, an island in the entrance to Ise Bay, and the adjacent port of Toba, to report the arrival of steamers bound for Yokkaichi and other ports in the bay.

Telephones of the World

Figures Presented in the Telegraph and Telephone Journal of the British Post Office

BY W. H. GUNSTON

THE following tables, it is believed, present as accurate a summary of the telephonic development of the world as it is possible to obtain up to so recent a date as January 1, 1913. The chief difficulties in the way of obtaining precise statistics are the reluctance of many private companies to furnish the required figures, and, even where that reluctance does not exist, the practical impossibility of approaching the thousands of small companies which operate telephones in the New World. There is a further difficulty to be met in the divergencies in the dates on which the financial years of different countries end. Some administrations for instance furnish statistics of their telephone systems as at December 31, some at March 31, others at June 30, others again are only able to give the figures for the preceding year; so that even in Europe, Asia, and Australasia, where precise official figures are tolerably easy to obtain, a slight element of inexactness necessarily enters because estimates have, in a few cases, to be resorted to in order to place all the figures on a common basis. These cases, however, form but a negligible proportion of the total, and it is satisfactory to note that one's estimates of previous years have been substantially justified by official figures subsequently obtained.

A somewhat melancholy interest attaches to this article, and more especially to that part of it which gives the incomplete figures for Europe for 1914. These figures, which came to hand before the outbreak of the war, are nevertheless sufficient to enable us to form an idea of the telephonic development of Europe at the beginning of the present year, and unhappily, there seems to be every probability that they will represent the high-water mark of that development, in some of the great states at least, for a long time to come. There is, moreover, little likelihood that official figures from many of the countries concerned will be available for some years, and what systems will then be included in the returns of the present administrations must remain a matter of conjecture. The number of telephone stations in Europe on January 1 of this year was probably 3,900,000, distributed as follows:

Germany	1,420,888
Great Britain	774,229
Russia (estimated)	360,000
France (estimated)	310,000
Sweden (estimated)	237,000
Austria-Hungary	229,650
Denmark (estimated)	130,000
Switzerland	96,624
Italy	94,796
Norway	83,850
Netherlands	78,743
Belgium	51,009
Other countries (estimated)	70,000

We have also received official figures relative to Japan, Egypt, South Africa, Canada, the United States (the Bell and allied systems), and Argentina; that is, for all the principal telephone-owning countries, except Australia, outside of Europe. A fair idea of the total number of telephones in the world can thus be arrived at:

Europe	3,900,000
Asia	310,000
Africa	58,000
North America	9,720,000
South America	170,000
Australasia	173,000
	14,331,000

Europe's heavy arrears, which under happier conditions might well have been expected to diminish steadily, are little likely to do so within the next few years.—*Editorial in the Telegraph and Telephone Journal of London.*

Several causes combine to render the tables which I have compiled for 1913 more accurate than those which I have prepared in previous years. The first and most important is the publication of the quinquennial census of telephones in the United States. This disposes of the greatest difficulty encountered in estimating the number of telephones in the world, because if the figure for North America (which contains three-fourths of the total for the world) is some thousands out, which may easily be the case when it is arrived at by estimating on the basis of probable increase and by the piecing together of information derived from companies in the United States, the estimate for the world is sensibly affected. Other causes are the availability of later and fuller figures for the Russian Empire, of an American consular report giving precise figures for the whole of South America, and of official information as to the Northern African states.

NUMBER OF TELEPHONES IN EUROPE.

Table I shows the number of telephones in Europe and the proportion of telephones to inhabitants. When allowance is made for the fact that last year the whole of the telephones in the Russian empire were included in Europe, it was seen that there was an increase of about 400,000 telephones in Europe between January, 1912, and January, 1913. As already stated, fuller information than heretofore was obtainable respecting Russia, the stations of leased, local, and private wire systems being now included. These swell the total to over 309,000, inclusive of telephones in Finland, but even excluding these, there was an increase in Russia of some 50,000 stations. The systems owned by Swedish companies in large cities of Russia are well developed. Petrograd has 46,842 stations, Moscow 43,348, and Warsaw 28,935. Riga possesses more telephones than either Marseilles or Lyons.

The increase of the number of telephones in Germany in 1912 was 121,770. There are at present no fewer than nineteen cities and towns in the German Empire with over 10,000 telephones.

The development of France outside of Paris is extremely poor, but there was an increase during the fifteen months following January, 1912, of 24,000 telephones. No city other than the capital possesses 10,000 stations, and only Lyons, Marseilles, and Bordeaux possess more than 5,000.

Austria increased her stations by 18,000, a large increase on a total of 127,293 telephones. In Sweden the increase was also nearly 18,000, or 9 per cent.

The increase in Great Britain was 32,000 after making allowance for an inventory adjustment made in September, 1912, by which the stations appearing in the books were reduced by 3,100. It should, in addition, be borne in mind that the real increase of the telephone system is not shown by the net addition to the total stations. A process of weeding out duplicate telephones, necessitated in several towns by competition which is now dead, has been going on slowly for several years. The number of telephones in Glasgow, for instance, has apparently actually declined since 1910 for this reason, and if the same process were applied to Sweden and the United

States a remarkable diminution in their annual increase would in all probability be seen. Great Britain is only second to Germany in the total number of stations operated, and possesses in all eleven urban telephone areas, containing upwards of 10,000 telephones.

The figures furnished for Finland related to 1911 and estimates have been employed to show the position at the end of 1912.

The figures shown in brackets in the following tables are those relating to January 1, 1914, which have up to the present come to hand. It may be estimated that the number of telephones in Europe at the beginning of this year was about 3,900,000.

TABLE I.—EUROPE.

Europe—	No. of Telephone Stations. Jan. 1, 1912.	Jan. 1, 1913.	Population. (Thousands).	Population per Telephone.
Denmark	107,153‡	119,398‡	2,757	23
Sweden	199,690	217,554	5,522	25
Norway	.....	78,000† 83,850*	2,392	30
Switzerland	84,058	90,573 96,624*	3,753	41
Germany	1,180,902	1,302,672 1,420,888*	64,926	49
Great Britain and Ireland	701,082	732,045 774,229*	45,365	62
Luxemburg	3,575	3,910 4,239*	260	67
Iceland	896	1,027	80	78
Netherlands	65,314	71,706 78,743*	6,102	85
France	260,998	285,095‡	39,601	139
Belgium	42,101	46,645 51,009*	7,516	161
Austria	127,293	145,179 160,017*	28,568	197
Hungary	56,183	63,432 69,633*	20,886	329
Roumania	19,438	20,500†	7,200	351
Italy	80,000†	90,000† 94,796*	34,686	373
Russia	186,024	269,900 }	138,467	450
Finland	36,000†	40,000† }		
Spain	26,747	29,660	19,588	606
Servia	.....	3,606	2,911	809
Portugal	.....	6,864 7,831*	5,960	876
Greece	1,760	1,967	2,631	1,384
Bulgaria	2,801	3,015	5,500	1,700
Bosnia-Herzegovina	802	1,012	1,828	2,077
Total, say	3,250,000	3,623,000	400,000	110

*Including Russia in Asia. †Estimated. ‡March 31.

ASIA.

Table II gives the number of telephones in Asia. This is considerably increased by the inclusion of the figures for Russia in Asia, which last year had to be included with those for Europe. Japan furnished more than three-quarters of the total. The figures for China are somewhat rough estimates based on reports in electrical papers of the progress of systems in Pekin, Shanghai, Tientsin, and Canton. The figures for Japan, the British, and the Netherlands Indies are official; those for Korea, Formosa, Ceylon, Siam, etc., are based on previous official figures.

There are altogether about 277,000 telephones distributed among the 900,000,000 inhabitants of Asia.

TABLE II.—ASIA.

	1912.	1913.
Japan	159,675	198,425 214,429†
Manchuria	.....	3,715
Chosen (Korea)	8,259	9,260
Sakhalin	358	393
Formosa	3,456	4,317
India	13,154	14,640
Netherlands East Indies	9,735	11,839
Russia in Asia	.....	12,600
China (estimated)	8,000	12,000
Straits Settlements	.....	1,749 2,935†
Indo-China (French)	747	857
Siam	686	800*
Ceylon	1,330	1,414 1,803†
Philippine Islands	.....	5,500*
Total, say	206,000	277,000

*Estimated. †Not including Russia in Asia.

AFRICA.

South Africa possesses more than two-fifths of the telephones on this continent. The system of Egypt, which is in the hands of a company, is second in importance. The French colonies and dependencies have power over 10,000 stations between them.

TABLE III.—AFRICA.

	1912.	1913.
Egypt	13,000*	16,096 (17,307)
Algiers	7,000*	8,004
Tunis	1,792	2,222
South Africa	18,700	21,922 (28,232)
Madagascar, Senegal, Dahomey (French)	581	700*
Total, say	40,000	50,000

*Estimated.

NORTH AMERICA.

Table IV gives the number of telephones in North America. The preliminary figures of the United States census report on telephones show that at the end of 1912 there were 8,729,592 telephones in the United States, of which 5,087,027 were owned by the Bell companies and 3,642,565 by independent companies. Of the 370,884 telephones in Canada at June 30, 1912, 174,336 belonged to the Bell Telephone Company, 38,797 to the Manitoba government and 26,486 to the British Columbia Telephone Company. No recent information is available respecting Mexico and the West Indies (with the exception of that relating to the Cuban Telephone Company), and the figures for these countries are therefore only approximate.

TABLE IV.—NORTH AMERICA.

United States—	Jan. 1, 1912.	Jan. 1, 1913.	Population (Thousands).	Population per Telephone.
American Tel. & Tel. Co. (Bell System)	4,474,171	5,087,027	.....	...
Systems in connection with the Bell	2,158,454 }	3,642,565	.....	...
Independent systems	1,725,000* }			
Total U. S. A.	8,357,000*	8,729,592	92,036	10.5
Dominion of Canada— 302,759, June 30, 1911 } 370,884, June 30, 1912 }	.....	say, 410,000	7,206	17.0
Cuban Telephone Company }	17,000	{ 11,500	.....	...
Other West Indian* }		{ 8,000	.....	...
Mexico*	16,000	25,000	.....	...
Total, say	8,700,000	9,184,000	110,000	12.0

*Estimated.

The number of stations on the Bell system of the United States and those in connection with it is now 8,133,017. From this the number of telephones in the United States on January 1, 1914, would appear to be about 9,150,000. The number of telephones in Canada at June 30, 1913, was 463,671.

SOUTH AMERICA.

The data for South America are, as I mentioned before, obtained from an American consular report and are fuller than the estimated figures published last year. They seem to err, however, on the side of generosity. The number of telephones in the Argentine, for instance, is given as 68,547, while the official census gives the number of telephones in that country as 63,747. Again, the Chile Telephone Company (the principal company working in Chile) has 12,650 subscribers, but the total number of stations in that state is shown in the report as 24,482.

TABLE V.—SOUTH AMERICA.

Argentine	68,547
Brazil	21,264
Bolivia	2,000
Chile	24,482
Colombia	1,700
Ecuador	2,550
The Guianas	1,220
Paraguay	350
Peru	3,800
Uruguay	9,210
Venezuela	4,568
	139,691

The total number of telephones in South America may therefore be computed at 135,000 instead of the 139,691 given in the consular report. The population of South America is 35,000,000, or one telephone to every 260 inhabitants. In the Argentine Republic there is one telephone to 113 inhabitants.

The number of telephones in the Argentine at January, 1, 1914, was 74,296.

AUSTRALASIA.

Table VI shows the figures for Australia and New Zealand, which are official in each case.

TABLE VI.—AUSTRALASIA.

	Jan. 1, 1912.	*Jan. 1, 1913.*	*Pop. (Thousands).*	*Pop. per Telephone.*
Australia—				
New South Wales	41,234	47,489	1,777	38
Victoria	29,784	33,775	1,380	41
Queensland	11,627	13,692	636	46
South Australia	8,513	9,890	430	45
West Australia	8,458	9,198	306	33
Tasmania	3,038	3,458	197	58
Total	102,654	117,479	4,733	40
New Zealand	40,598*	41,451*	1,070	26
*March 31.	143,252	158,930		

From the six foregoing tables it will be seen that the total number of telephones in the world at January 1, 1913, was as follows:

Europe	3,623,000
Asia	277,000
Africa	50,000
North America	9,184,000
South America	135,000
Australasia	158,900
Total	13,428,000

It may be of interest to show here the total number of telephones in the British Empire. They are:

Great Britain and Ireland	732,000
Canada	410,000
Australia	117,000
New Zealand	41,000
South Africa	22,000
India and Ceylon	16,000
Shanghai, Hong Kong, Singapore, West Indies, etc.	8,000
Total	1,346,000

Investigation of Inductive Interference

California Joint Committee Report as Presented Before the A. I. E. E.—Continued from October

APPENDIX I—HARMONICS.

ANY complex electrical wave of periodic structure may be resolved into component sine waves of suitable amplitudes and phase differences, having frequencies which are in integral relation to the fundamental frequency. The simple sine wave of lowest frequency is termed the fundamental, and those of higher frequency are termed harmonics of the fundamental wave. The fundamental may be considered the first harmonic. The analysis of a periodic wave into its constituent sine waves or harmonics is not merely a mathematical conception or process, but is in accordance with the facts of electricity and acoustics.

In general, alternating-current systems, by virtue of their inherent characteristics, do not permit the existence of harmonics other than odd integral multiples of the fundamental frequency, i. e., 3rd, 5th, 7th, 9th, 11th, etc., harmonics. Such harmonics may exist in either or both the current and voltage waves of a power system.

Commercial frequencies of power transmission in California are 25, 50 and 60 cycles per second. The power systems, so far investigated, operate at a fundamental frequency of 60 cycles per second. The investigation has shown harmonic currents and voltages of appreciable magnitude up to the 35th harmonic. On one system the 23rd (corresponding to a frequency of 1,380 cycles per second) has been found to be prominent. Induced currents and voltages in parallel communication circuits have been observed corresponding to these harmonics.

The detrimental effect of the induced voltages and currents in parallel communication circuits depends, in general, upon their magnitude and upon the frequency of the induction as compared with the operating frequency of the communication circuit. The presence of extraneous current of a frequency approaching that of normal operating frequency of the communication circuit has a more injurious effect than the same amount of current of a frequency far removed from the operating frequency of the circuit.

The frequency of the voice currents flowing in a telephone circuit ranges from about 200 cycles per second up to possibly 2,000 cycles per second. The average voice frequency is considered to be approximately 800 cycles per second, and at about this frequency the telephone receiver is most sensitive. It is on account of these considerations that extraneous currents of the higher frequencies, arising from the harmonics of a power system, are relatively more detrimental to telephone service. The harmonics of the power systems have been found to be responsible for the greater portion of the inductive interference to telephone service, under normal operating conditions of parallel power circuits. Any extraneous current of a frequency within the audible range produces a disturbance which impairs the efficiency of a telephone circuit. The combined effects of all extraneous currents present, of frequencies within the range of audition, constitute the humming "noise" heard in the receiver of a telephone circuit which is subject to induction.

The effect of currents of the fundamental frequency (60 cycles or less) on telephone circuits is relatively unimportant as compared to that of higher harmonics, owing to the fact that the fundamental approaches the lower limit of audible frequencies. However, if the induction due to the fundamental becomes sufficiently great, constituting a physical hazard, or of such magnitude as to operate the protective devices on the telephone circuits or interfere with superimposed telegraph service or other grounded signaling devices, it is then of great importance from the standpoint of interference.

In regard to the effect of extraneous currents on the operation of telegraph circuits, for reasons analogous to those given above, such circuits are relatively more affected by extraneous currents of fundamental frequency or of the frequencies corresponding to the lower harmonics such as the 3rd and 5th.

At the present time the American Telephone and Telegraph Company is undertaking, on behalf of the Joint Committee on Inductive Interference, an extensive series of tests in regard to the detrimental effect of extraneous

currents of various frequencies on the intelligibility of telephone conversation. In addition, this company, in conjunction with the Western Union Telegraph Company and the Postal Telegraph Cable Company, is undertaking an investigation of the effect of extraneous currents on the operation of telegraph circuits and apparatus of different types.

Harmonic currents and voltages in power circuits arise from many causes. Generators or other rotating machines do not, in general, produce pure sine waves of fundamental frequency. This is due to several features in the design of the apparatus. A certain amount of distortion of wave form, with the consequent introduction of disturbing harmonics, is inherent with the use of transformers. This distortion of wave form is due to hysteretic action in the iron core of the transformer. The distortion varies in character and magnitude with the saturation and characteristics of the iron employed. Certain connections of transformers are possible which will suppress the third harmonic and its multiple in a three-phase power system. The fact that practically all inductive interference to telephone circuits is due to the harmonic currents and voltages renders it important that an effort be made to obtain rotating machinery for use in power systems which produces as nearly as is reasonably possible pure sine waves of fundamental frequency, and also that an effort be made to obtain transformers and to arrange connections of the same in such a manner as to reduce as far as practicable the distortion of wave form.

APPENDIX II—BALANCED AND RESIDUAL VOLTAGES AND CURRENTS.

This appendix comprises the four following sections:

1. Analysis of Voltages and Currents and Discussion of the Effects of their Components.
2. Causes of Residual Voltages and Currents.
3. Means for Preventing or Reducing Residual Voltages and Currents.
4. Discussion of Tests.

1. *Analysis of Voltages and Currents and Discussion of the Effects of their Components.*—To facilitate the analysis of inductive effects in parallel communication circuits, arising from a power circuit, the voltages and currents of the power circuits can be conveniently regarded as consisting of components which exhibit distinct characteristics and which may be treated separately.

Considering a three-phase circuit having equal voltages between any two conductors, the voltages to ground from the conductors can be resolved into two sets of components, balanced components and residual components. Since the voltages between any two conductors are equal, the voltages between the conductors may be graphically represented by three vectors forming an equilateral triangle. The potential of the ground may be represented by a point which may be inside or outside of the triangle, depending on the magnitude and character of the residual voltage, and the actual voltages to ground from the conductors may be represented by three vectors drawn between the point representing the ground potential and the corners of the triangle. The balanced components of the voltages to ground from the conductors consist of three equal voltages whose vector sum is zero and which are therefore displaced one-third cycle in time phase with respect to one another. These balanced components may be represented by three vectors drawn from the center of the equilateral triangle to the corners. The residual components of the voltages to ground from the conductors consist of three equal voltages which are in phase with one another and which may be represented by three identical vectors drawn from the point representing the ground potential to the center of the equilateral triangle. If the residual voltage is zero, the point representing the ground potential will be at the center of the triangle. The residual voltage of the system is defined as the vector sum of the voltages of the three conductors to ground. It is therefore, by definition, three times the residual voltage of the individual conductors, or three times the equivalent single-phase voltage of the three conductors in parallel with respect to the earth. It should be noted that the inductive effect of the residual voltage is equal to that of a single-phase voltage between ground and the three conductors in parallel equal to the residual voltage of the individual conductors or to one-third the residual voltage of the system.

If one conductor is grounded, the residual components (assuming the voltages between wires remain unchanged) will each equal the voltage between conductors divided by the square root of three, and the residual voltage of the system will be equal to the voltage between conductors multiplied by the square root of three.

If a power circuit consists of a single conductor with ground return, the residual voltage will be equal to the voltage from the conductor to ground.

The currents flowing in the three wires of a three-phase, three-wire circuit can be considered to be composed of three sets of currents, namely, (1) balanced components consisting of equal currents in each of the three line wires whose vector sum is zero, and which are, therefore, displaced one-third cycle in time phase with respect to one another; (2) a single-phase current flowing in a loop composed of two of the line wires; (3) a residual current divided equally between the three line wires and returning through the earth. The residual current of the three-phase circuit is defined as the vector sum of the three line currents. It is, therefore, the equivalent of a single-phase current through the three line conductors in parallel, with the earth completing the circuit.

In the case of a power circuit consisting of a single conductor with a ground return, the entire current flowing in the conductor is residual.

In the above discussion reference is made to three-phase, three-wire power circuits, but the analysis there given may be generalized so as to apply to a power system of any number of phases. Most electrical power transmission systems are of the three-phase, three-wire type and subsequent statements will apply particularly to such systems, unless otherwise stated.

At a point in the vicinity of a power circuit, such as might represent the location of an element of a communication circuit conductor, the resultant electromagnetic field due to the balanced currents would be zero if the power circuit conductors were equidistant from the point (disregarding the effect of the earth). In general, the power circuit conductors are not exactly equidistant from such point, and therefore the resultant electromagnetic field due to balanced currents is not zero. For this reason, the balanced currents in the power circuit have unequal effects on the communication circuit, hence there is a resultant induction. For residuals, there is, in general, a much greater inequality in the distances between the affected conductors (or circuits) and the sides of the residual circuit (power conductors in parallel one side, earth other side) than in the distances to the several power conductors, which constitute the circuit for the balanced components. Thus the resultant electromagnetic field due to residual currents is large in comparison with the field

set up by balanced currents of the same magnitude. It may be noted that the electromagnetic forces at any point due to residual currents in the different power conductors are in the same time phase, hence the inductive effects of all the residual components are cumulative and not differential as in the case of the balanced components.

In a similar way it may be shown that residual voltages produce proportionately far greater inductive effects than balanced voltages.

Computations based on the physical characteristics of two of the parallels investigated show that, for an exposure near Salinas for eight miles with a 55,000-volt line on the opposite side of the county road from a communication line, one ampere of residual current produces as much induction in a ground return communication circuit as would forty amperes of balanced current; and one volt residual produces as much induction as one hundred and ten volts balanced. Similar computations based on the physical characteristics of an exposure betwen Santa Cruz and Watsonville, where the communication circuits are parallel for seventeen miles by a 22,000-volt line on the opposite side of the county road, show that one ampere residual produces as much induction in a ground return communication circuit as would 240 amperes of balanced current, and one volt residual produces as much induction as twenty-five volts balanced. All of the above comparative values are for current and voltages of 60 cycles frequency.

The above values illustrate the relative induction-producing powers of balanced and residual currents and voltages in two specific cases. Such values will vary considerably for different parallels, but these cited may be taken, in a general way, as inductive of the relative severity of the effects on a single conductor produced by these two factors. Such values for a unit length of non-transposed circuit in any given parallel are dependent upon the separation, height and configuration of the conductors of the two classes of circuits, and upon the character and condition of the ground and neighboring objects. For the entire parallel, or total length of exposure, these values are further dependent upon transpositions. The actual amount of induction arising from each of the two components depends also upon the actual magnitudes and the frequencies of the components in the power circuit.

It will be shown in Appendix III that inductive interference arising from balanced currents and voltages can be reduced by proper transpositions in the power circuit, but that power circuit transpositions do not reduce the inductive interference produced in a parallel communication circuit by residuals. Residual currents and voltages act inductively to produce the same effects as a single-phase grounded circuit operating with the three line conductors in parallel. This generally represents the worst possible condition from the standpoint of inductive interference. Transposing the conductors of the power circuit cannot reduce the inductive interference arising from residuals, except in so far as the magnitude of the residual voltages and currents is reduced by such transpositions. The effect of power circuit transpositions on the magnitude of these components is discussed below.

In the detailed discussion of transpositions in Appendix III it is shown that transpositions in a communication circuit can reduce the induced voltages from residuals only as between the two sides of a metallic circuit.

In view of the above it is evident that attention must be given to the problem of restricting residuals to amounts which do not cause material interference either to grounded communication circuits or to properly transposed and balanced metallic circuits.

2. *Causes of Residual Voltages and Currents.*—While a degree of balance of the voltages and currents of the power system may be obtained which satisfies all the practical demands of power operation, this may not be sufficient to prevent the production of residuals sufficient to cause serious inductive interference to parallel communication circuits.

Residual currents and voltages may arise from one or more causes which act singly or together. The principal sources of residual currents and voltages are:

1. Unbalanced loads between the three phases and the neutral of a grounded star-connected system.

2. The introduction of the third harmonic and its odd multiples as residual current and voltage due to certain apparatus and connections employed on a grounded star-connected system.

3. Unbalanced capacity and leakage between the several phases of the system and ground. This applies more particularly to systems isolated from ground.

There are two principal types of commercial three-phase power circuits used in California:

1. The grounded neutral circuit or network in which all important generating points have a grounded neutral and in which all or part of the receiving points may be connected with a grounded neutral. No resistances are inserted between the neutrals and ground.

2. The isolated circuit or network which normally has no metallic connection to ground at any point.

The characteristics of the grounded neutral system with particular reference to residuals are as follows:

Under Normal Conditions.—(a) The impedances between line conductors and ground are determined very largely by the load impedances of the transformers. With balanced loads the residual voltage other than the third harmonic and its odd multiples may be eliminated.

(b) The effect of unbalanced loads on the residual voltage is small, as the tendency of generators and transformers is to maintain equal voltages between the several conductors and ground.

(c) With balanced loads the residual current, other than the third harmonic and its odd multiples, may be eliminated.

(d) Unbalanced loads between line and neutral cause corresponding residual currents, which will be large if the unbalance is large, as such unbalanced load currents flow through the neutral to earth.

(e) The varying permeability of the iron in star-connected transformers with grounded neutrals introduces the third harmonic and its odd multiples as residual voltages and currents. The use of delta-connected secondary windings reduces this effect greatly below that of star to star connections.

(f) Grounded star-connected generators connected directly to the line or through grounded star to star-connected banks of transformers, may introduce the third harmonic and its odd multiples as residual voltages and currents.

Under Abnormal Conditions.—(g) A ground on one phase short-circuits that phase through the neutral connection and causes a residual current throughout the whole length of the circuit, this current being practically equal to the short-circuit current to ground on that portion of the circuit between the sources of power supplying the fault and the point where the circuit is grounded. A large residual voltage (approaching as a maximum 58 per cent of the voltage between phases) will be created

in proximity to the fault, and if the low-tension side of the receiving transformers is star-connected throughout that portion of the circuit between the fault and such receiving transformers. If the neutral of the receiving transformers is isolated, the short-circuit current will exist only between the source of supply and the fault and there will be no residual current between the fault and such receiving transformer. The above-mentioned residual voltage will in this case exist not only in proximity to the fault on the supply side, but also throughout the length of circuit from the fault to the receiving transformers. The power circuit is rendered inoperative.

(h) An open condition of one phase causes a large residual current, as the unbalanced load currents of the other two phases must flow through the neutral to earth. A large residual voltage will exist beyond the fault if the low-tension side of the receiving transformers is star-connected. The power circuit may not be rendered inoperative for three-phase supply beyond the fault, in case the receiving transformers are grounded star-delta connected.

The characteristics of the isolated system with particular reference to residuals are as follows:

Under Normal Conditions.—(a) The impedances between line conductors and ground are determined by the electrostatic capacities and the leakage between the several conductors and ground. With balanced loads a residual voltage may exist due to unbalanced capacity and leakage. Such residual voltage as is due to unbalanced capacity may be eliminated by transposing the circuit so as to equalize the electrostatic capacities to ground of the several phases. If there are single-phase branches making the total lengths of the three conductors unequal, this will introduce inequalities among the capacities to ground which it may not be possible to balance by transpositions. Inequalities in capacity or leakage result in unequal voltages between the different line conductors and ground.

(b) The effect of unbalanced loads on the residual voltage is very slight.

(c) With balanced loads a small residual current consisting of unbalanced charging current may flow, due to non-uniform distribution of unbalanced capacity and leakage.

(d) Unbalanced loads have but a slight effect upon the residual current.

(e) The transformers cannot introduce the third harmonic and its odd multiples as residual voltages or currents.

Note.—Due to unsymmetrical three-phase connections sometimes employed (such as open-delta and Scott connections) the third harmonic and its odd multiples may appear in the voltages between lines and in the line currents, creating dissimilarities in the wave forms for the several phases. These harmonic components of the line voltages and currents are affected by unbalanced capacity and leakage in the same way as any other components as may appear in the residuals. It should be noted, however, that such harmonics are not impressed directly upon the line as residuals as is the case with grounded neutral systems.

(f) The generators cannot introduce the third harmonic and its odd multiples as residual voltages and currents.

Note.—If a two-phase generator containing a third harmonic in its voltage wave supplies the line through Scott or other two to three-phase transformer connections, the third harmonic will appear in the voltage between lines. Subject to the conditions of the circuit as regards capacity and leakage balance, this harmonic along with all others may or may not appear in the residuals.

Under Abnormal Conditions.—(g) A ground on one phase causes a large residual voltage (173 per cent of the voltage between phases) throughout the entire length of the circuit. A residual current will be created in proximity to the fault, its magnitude increasing with the extent, voltage and frequency of the system. The power circuit may not be rendered inoperative and the power company operators may be unaware of the existence of the abnormal condition. In some cases the residual voltage and current are greatly augmented by the resonant effects accompanying arcing grounds.

(h) An open condition of one phase may cause a large residual voltage, a certain amount of residual current will flow, due to the interchange of unbalanced charging current, between sections of line on either side of the fault. The power circuit is rendered inoperative for three-phase supply beyond the fault.

A consideration of the characteristics of the two types of systems indicates that under normal operating conditions, with balanced loads upon all phases, the residuals of the grounded neutral system may be limited to the third harmonic and its odd multiples. The magnitude of these harmonics is dependent largely on the type of connection on the low-tension side of the transformer banks, the delta being preferable to star connection. Under the same condition the residuals of the isolated system may be limited to those resulting from unbalanced leakages to ground, which should be small on a well-maintained system. The effect of an unbalance in the loads connected between conductors upon the residuals of either type of system is small, while the effect of an unbalance in the loads connected between conductors and ground upon a grounded neutral system is to cause a residual current which is proportional to the amount of such unbalance, which will be large if the unbalance is severe. The residual current due to this cause consists of the fundamental and all harmonics present in the line currents, in addition to which the third and its odd multiples are introduced as before by the varying permeability of the transformer iron, and in some cases by the generators.

Under abnormal conditions both types of systems give rise to residuals which are liable to cause interruption and damage to parallel communication circuits. The most frequent abnormal condition which produces severe interference is an accidental ground. A ground on one phase of a grounded star-connected system creates a severe and widespread electromagnetic unbalance, giving rise to corresponding inductive effects. This is accompanied by an electrostatic unbalance in the vicinity of such ground. On the lower voltage systems this latter effect is relatively of little importance. On the other hand, a ground on one phase of an isolated system creates a severe and widespread electromagnetic unbalance, giving rise to corresponding inductive effects. This is accompanied by an electromagnetic unbalance in the vicinity of the ground. On small low-voltage isolated systems, such electromagnetic unbalance is relatively of little consequence, but it should be noted that with increased voltage and extent of the system such effects do become of great importance, giving rise to electromagnetic disturbances in exposed communication circuits in addition to the electrostatic disturbances.

The magnitude of the inductive effects from either type of system is dependent upon the character of the exposure, extent of the power circuit and other factors which render it impossible with the information at hand to draw a definite conclusion as to the relative total amounts of interference inherent with the two types of

system. Furthermore, it is not necessarily true that either type of connection has an advantage from the inductive interference standpoint for power systems of all sizes and voltages.

3. *Means for Preventing or Reducing Residual Voltages and Currents.*—To minimize or prevent residual voltages and currents due to cause 1, it is necessary to equalize as closely as practicable at all points the load between the several phases of the circuit and the neutral, or to remove the ground path for unbalanced load currents, thus allowing a grounded neutral at one end of the circuit only. As it is difficult, if not impossible, to maintain all loads in a state of equilibrium at all times, the latter method has the advantage of greater reliability.

Single-phase connections to ground should not be employed. Where single-phase loads or unbalanced three-phase loads must be supplied, the transformers supplying such loads may be connected across the line wires, or may be connected star to delta, with the neutral not grounded. It should be noted that single-phase or unbalanced three-phase loads on the low-tension or delta side of grounded star to delta-connected transformers produce effects on the high-tension side similar qualitatively to single-phase loads between line and ground, but these effects are greatly reduced in magnitude by the inherent balancing influence of transformers so connected, due to the fact that all three transformers participate in supplying such a single-phase load.

Residuals which arise from cause 2 may be greatly reduced by means of certain types of connections for generators and transformers. Thus for example, connecting the secondary windings of the transformer banks in delta largely suppresses these components of the residual voltage and current, but does not entirely prevent them. Where the transformers are connected grounded star to star, these components can be, to a certain extent, kept out of the line by the use of a second bank of transformers having a delta connection on one side and a star connection on the side in common with the first bank, with the neutral interconnected.

The possibility of the introduction of third harmonic residuals on the line due to the use of grounded star-connected generators may be avoided by the employment of transformers between generators and line, the windings on the generator side of the transformers being isolated from ground.

To eliminate or reduce residual currents and voltages which may be due to cause 3, it is necessary to transpose the conductors of the power circuit so as to equalize the electrostatic capacities of the several phases to ground, and this equalization must be attained within distances sufficiently short to prevent the accumulation of large unbalances. With a horizontal arrangement of conductors, the capacities to ground are more nearly equal that with the triangular or vertical arrangement. It is probable that the electrostatic capacities are the controlling factors in determining the residual voltage and current of an isolated system under normal operation, and while an investigation of the extent to which such residuals may be reduced by properly spaced transpositions has not yet been made, it is reasonable to suppose that transpositions will be substantially effective. The effect of unbalanced leakage cannot be controlled, except through proper construction and maintenance of the power system. It is to be noted that the maintenance of the system free from accidental grounds and partial grounds becomes increasingly difficult the larger the extent of the power network.

On a grounded star-connected system, the electrostatic capacity and the leakage of the several phases to ground are relatively less effective in producing residual voltage, as on such systems the voltages to ground are determined almost entirely by the generators and transformers.

4. *Discussion of Tests.*—Having given a general analysis of the causes and effects of and means to reduce residual currents and voltages, it is desirable to call attention to the results of tests which have been conducted which have a bearing on this subject.

At Salinas the effect of grounding or isolating the neutral of the auto-transformers, which have also a secondary delta winding, was investigated. These auto-transformers are supplied at 55,000 volts over a transmission line which parallels the circuits of the Pacific Telephone and Telegraph Company in what have been termed exposures No. 1 and No. 2. These auto-transformers in turn supply a 33,000-volt line of the Coast Valleys Gas and Electric Company, extending from Salinas to King City, a distance of approximately forty-five miles, and paralleling throughout practically this entire length the coast route toll lead of the Pacific Telephone and Telegraph Company. These same telephone circuits are involved in the parallels with the 55,000-volt line north of Salinas. In addition to supplying the King City line, this bank of auto-transformers at Salinas supplies a 22,000-volt line extending to Monterey, a distance of approximately eighteen miles. Aside from the ground on the transformer neutral at Salinas, there are no grounds on either the 33,000-volt line or the 22,000-volt line. The 55,000-volt line supplying the Salinas transformers is energized at the Guadalupe substation of the Sierra and San Francisco Power Company, approximately seventy-three miles distant from Salinas, through grounded star-connected auto-transformers, which have delta-connected secondary windings, and which are supplied by the 104,000-volt line of this same system, which operates with grounded neutral connection at its main generating station and substations. It will be understood from this statement of conditions that the neutral current at Salinas is not identical with the residual current of any one of the three high-tension lines which are connected together by these auto-transformers. The condition of the Salinas neutral affects the induction arising from the several exposures through its effect on the residual currents and voltages of the high-tension lines connected to the auto-transformers at that point. A representative value of the neutral current at Salinas during these tests is 0.3 ampere. It is composed almost entirely of the ninth harmonic, the fundamental and the third harmonic, their magnitudes decreasing in the order named. With the power system in normal operation, isolating the neutral of the auto-transformers at Salinas did not greatly affect the resultant induction in the particular exposures under observation. The values in the following table, taken from the data of the tests, indicate the effect of the condition of this neutral on the residual currents of the 55,000-volt and the 33,000-volt lines.

RESIDUAL CURRENT AT SALINAS—AMPERES.

Order of Harmonic.	55,000-Volt Line. Neutral at Salinas—		33,000-Volt Line. Neutral at Salinas—	
	Grounded.	Non-Grounded.	Grounded.	Non-Grounded.
1	0.120	0.057	0.061	0.073
3	0.054	0.160	0.075	0.120
9	0.073	0.100	0.120	0.075

Two reasons may be given for the fact that the condition of the Salinas neutral does not greatly affect the resultant residual current of these lines: (1) the load balance on these lines is such that a relatively small amount of load current flows through this neutral; (2) as

three high-tension lines are connected together by these auto-transformers, opening their neutral connection to ground does not completely eliminate the path for the residual current of any one of the three lines, since it may then flow to earth through the admittance to ground of the other two lines.

These particular conditions are not commonly found, but a similar condition, in that there is a path to ground for residual current aside from the neutral connection, prevails in any case where the power circuit extends for a considerable distance beyond such neutral connection. The investigation showed, for the conditions which applied to the 55,000-volt line, that removing the neutral ground connection beyond the parallel decreased the fundamental and increased the third and ninth harmonics in the residual current as shown in the above table. It is not to be concluded, however, from this one case that the third harmonic and its odd multiples in the residual current would in all cases be increased by removing the neutral ground connection of a bank of receiving transformers where the circuit extends beyond the point of measurement of such residual current. If the circuit is terminated at the transformer bank, the removal of the neutral ground connection must eliminate the residual current at that point.

In the case of the 33,000-volt line, the grounding of the neutral at Salinas merely gave another and nearer grounded neutral point on the line supplying power, but did not give a grounded neutral point in each direction from the point of measurement of the residuals as it did in the case of the 55,000-volt line. As the 33,000-volt line has no grounded connection beyond Salinas, the residual current must flow to ground entirely through the admittance of this line to ground. The residual current, therefore, diminishes to zero at the King City end of the line. Isolating the neutral of the Salinas transformers affects the constituents of the residual currents in this line arising from the Salinas transformers, and those impressed by the 55,000-volt line in such a way that they combine vectorially to give a different resultant from that with the Salinas neutral grounded. The result is to increase the fundamental and third harmonic and to decrease the ninth harmonic when the neutral is isolated. The residual current in the 22,000-volt line was not determined, but residual voltage measurements were made with the Salinas neutral isolated and grounded and the results are included in the following table, from which it may be noted that the fundamental, third and ninth harmonics were all greater with the Salinas neutral isolated.

The banks of star-connected auto-transformers at the Guadalupe and Salinas substations are provided with closed-delta secondary windings, which in the case of Salinas supply power for local consumption. An experimental opening of the delta at Salinas demonstrated, as would be anticipated, that the use of such delta-connected secondary windings reduces, in a large measure, the third harmonic introduced by these transformers in comparison with its value without the use of such delta-connected windings. If grounded star-connected transformers are used, it is important, therefore, from the standpoint of induction, to provide such transformers with closed-delta connected secondary windings or with other means of reducing the third harmonic and its odd multiples. Such means may, however, in some cases be insufficient to reduce the residuals to such low values that they will not produce harmful inductive interference to parallel communication circuits.

The investigation on the system of the Coast Counties Gas and Electric Company shows results which are summarized in the following table with reference to the residual current and residual voltage. Santa Cruz, where the measurements were made, is twenty miles from one source of supply and seventy-five miles from the other end of the line where power was also supplied. For the sake of comparison the averages of the residual voltage of the 22,000-volt line between Salinas and Monterey, a distance of eighteen miles, are also given:

Order of Harmonic.	Residual Voltage—Volts. Neutral at Salinas— Santa Cruz.	Grounded.	Non-Grounded.	Residual Current Amperes. Santa Cruz.
1	360	50	90	0.094
3	...	150	320	....
9	19	40	50	0.021
11	14	...	...	0.017
13	10	...	...	....
23	14	...	...	....

The system of the Coast Counties Gas and Electric Company is isolated from ground and employs a number of Scott-connected and open-delta-connected transformers. The residuals at Santa Cruz on this system are composed principally of fundamental, ninth and eleventh harmonics. The fundamental is predominant. The third harmonic is absent or too small to measure accurately. It should be noted here that the use of Scott and open-delta-connected transformers permits the third harmonic and its odd multiples to exist in the line voltages and currents of a three-phase isolated system. In all probability the residuals on this system are caused by unbalanced admittances to ground of the power line conductors. As has already been pointed out, that part of the unbalance due to electrostatic capacity could be greatly reduced by properly spaced transpositions in the power circuit. In contrast to the results at Salinas, the residuals of this system exhibit a prominent fundamental and the absence of or relatively small amounts of the third harmonic and its odd multiples.

(*To be concluded.*)

Iowa College to Train Telephone Engineers

Out of a conference held at Ames, Iowa, between gineering faculty of Iowa State College has come to a definite program for new educational work in the telephone ite program for new educational work in the telephone field in Iowa. The collegiate courses in electrical engineering at the college will be enlarged for the more complete training of experts in telephone engineering. The extension work will be enlarged to provide for correspondence courts and for local extension schools for operators, and line and plant men, and a series of bulletins will be put out dealing with various practical problems in telephone construction and management.

In enlarging the instruction in telephone engineering, the engineering faculty will have the co-operation of a permanent committee of telephone men. This committee will assist especially in securing equipment for laboratories.

Extension classes will be established soon in co-operation with a committee. One such school will be held in connection with the next annual convention of the Independent Telephone Association of Iowa, continuing four days and dealing with problems of line and plant men. Probably four other schools will be conducted in as many sections of the state for operators; each school will probably last four or five days and will deal with practical problems of women at switchboards. Later a two-year vocational course will be offered. The correspondence courts will be organized this year.

The Telephone Scrap Book

Curious and Useful Items, More or Less Telephonic, Gathered from Everywhere

New Radio-Telephony Systems

THE radio-telephone systems devised by the Italians Marzi, father and son—the former for some years director of the Rome telephones—and the French officers Jeance and Colin have lately given very satisfactory results during trials on the Continent, according to the London *Electrical Review*. Experiments with the Marzi system were made from the Goldschmidt station at Laeken* (Brussels), messages emitted being received at Antwerp, Sain, Trond, Luttich, Bostonge, Namur, Tournai, Ghent, Coutrai, Bruges and other places. Finally very successful trials were made between Brussels and the Eiffel Tower, an orchestral and vocal concert being satisfactorily reproduced, despite unfavorable atmospheric condition, when using 1½ amps. primary microphone current and 3 amps. secondary microphone and aerial current in the Brussels station. Successful radio-telephony requires the use of a generator of high frequency and very uniform oscillations and a microphone capable of imposing on such a current oscillations corresponding to those of speech waves. A suitable generator is obtainable without much difficulty, but a microphone constitutes the most serious stumbling block in any system of wireless telephony yet devised. With all ordinary forms of carbon microphones the trouble is that the granules overheat and become covered with an insulating sheath, unless the working current is so weak that it does not suffice to control adequately the aerial current. Numerous attempts have been made to cool the carbon by metal or other heat conductors, air or water currents and so on, but in the Marzi microphone a new principle is employed. Instead of a stationary carbon contact, a moving contact is established by a stream of carbon granules, each of which remains in circuit too short a time to be injuriously heated. The Marzi microphone resembles the liquid microphones of Chichester Bell and Majorana in respect of continuous substitution or renewal of contact, but is distinguished from these types in that contact is restricted to the points of contact of the granules with a membrane instead of being distributed over a comparatively great length of the latter; the microphone effect is therefore greater and sharper than in hydraulic microphones.

Referring to *A*, Fig. 1, a horizontal lever *2, 3* plays between the poles of electromagnets *1, 1* and carries a sphere *7* the upper half of which is platinized and lies within a platinized cup, mounted on the bottom of a cylinder *5*. From the latter, fine carbon granules flow between the surfaces *9, 9* into a receptacle *10* when the magnets *1, 1* cause *2, 3* to oscillate in sympathy with speech or other sound vibrations. At other times the surfaces *9, 9* are held together and no granule flow takes place. When the apparatus is in use, the resistance between *9, 9* varies in proportion to the speech currents. Each granule is in circuit between *9, 9* too short a time to be heated appreciably, hence the carbon can be returned to *5* for indefinitely repeated use.

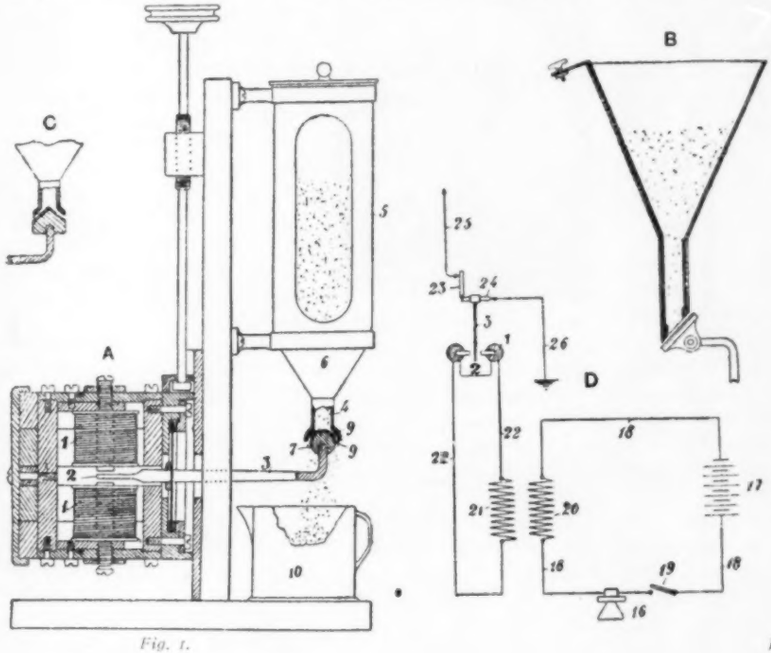


Fig. 1.

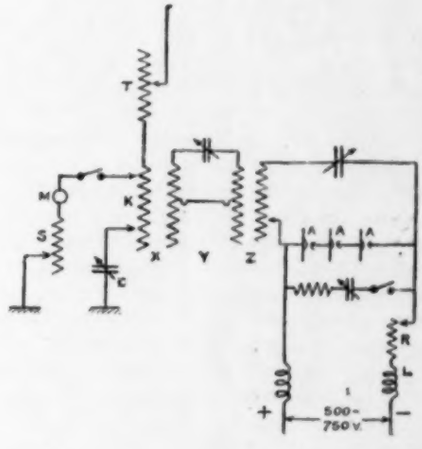


Fig. 2.

B and *C* represent alternative arrangements for the variable carbon-flow gap, and *D* shows the circuit connections employed. Speech or other sounds to be transmitted are directed into an ordinary microphone *16*, connected in series with a switch *19*, battery *17* and a primary coil *20* of a transformer, the secondary winding *21* of which is connected to the electromagnet *1* of the heavy current microphone already described and now represented by the pivoted lever *2, 3* and the variable-

*This station was destroyed by the Belgians prior to the German occupation of Brussels.

gap contacts *23, 24*. The transmitting oscillating circuit is connected across *23, 24*, a modification of the Moretti arc being used as the source of energy. Each arc is established by 600 volts p. d. between two metal electrodes, one of which is kept in continuous rotation. A frequency of 120,000 oscillations per second is obtained and a single arc suffices for distances up to 200 miles. With four arcs in series on a 2,400 volt supply, satisfactory communication has been established between the Italian arsenal at Spezia and Messina (520 miles). The apparatus is very compact and light (height 18 inches, weight 9 pounds).

For reception, a very sensitive crystal detector with regulable condenser in the aerial and telephone circuits is said to be best. There follow in order of efficacy De Forest's audion valve, Fleming's valve (working at 4 volts from a battery of three accumulators with regulating resistance), and carborundum and electrolytic detectors.

The French officers Jeance and Colin also employ arcs to produce the high-frequency fundamental current on which speech variations are imposed. These investigators have devoted special attention to the problem of eliminating disturbances due to variations in the arc current. In the latest modifications of their system, the arc current is "filtered" free from all amplitudes and frequencies outside prescribed limits, leaving in the aerial a sinusoidal current of constant frequency and amplitude.

At the sending station three arcs, *A*, Fig. 2, are used in series, each burning between a copper disc anode and a carbon rod cathod. The arc burns in an atmosphere of acetylene and hydrogen (produced simultaneously in a calcium carbide and hydride generator) which prevents combustion of the carbon electrode or even adds slightly to its length. The copper electrode forms the bottom of a paraffin-filled water-cooled cylinder, and such slight arc adjustments as are required from time to time are made by hand. By varying the d. c. supply pressure between 500 and 750 volts, the arc current is varied from 3½ to 4½ amperes. Direct current is fed through choke coils *LL* and a variable resistance *R* to three parallel circuits, across the center one of which (the arc circuit) there is available 250-350 volts. On changing over from sending to receiving the pressure is reduced to 150 volts and a resistance automatically switched in current. The main oscillating circuit *X*, comprising a variable condenser and inductance, is coupled by an intermediate tuning circuit *Y* to the antenna circuit *Z*. The intermediate circuit *Y* prevents transmission of foreign frequencies to the aerial circuit which comprises a coupling coil *K*, regulable condenser *C* and inductance *T*. Across *K* and *C* are connected a variable inductance and the microphones in series, all spoken into at once by aid of a megaphone. This method of connecting the microphones eliminates sparking and places no limit on the microphone current. One of the two duplicate microphone sets cools while the other is in use. Regulable air condensers make possible most accurate tuning, this being very sharp owing to the purity of the transmitting aerial oscillations. The wave length can be varied within wide limits. Experiments carried out with 985 meter waves between Paris and various amateur and portable installations in the vicinity (distances up to 150 miles) show the Jeance-Colin apparatus to be simple and very satisfactory in use.

Telephone Useful to Fish-Hawks

WHILE a recent inspection was being made of the open wire trunk line extending from South Amboy to Atlantic Highlands, N. J., says Chester N. Weems, in the *Telephone Review*, it was discovered that one of our poles was very rapidly assuming the appearance of an apartment house for fish-hawks, as will be seen from the accompanying illustration. The top arm had been completely furnished with a neat little nest extending from pin No. 4 to pin No. 7, which, while making an ideal abode for Mr. and Mrs. Fish-hawk, did not, in the opinion of the linemen who were making the inspection, lead to any decided improvement in transmission on the trunks involved. Consequently the linemen removed the nest, though not until some very active protests made by the builders were overruled through the instrumentality of two substantial wooden clubs.

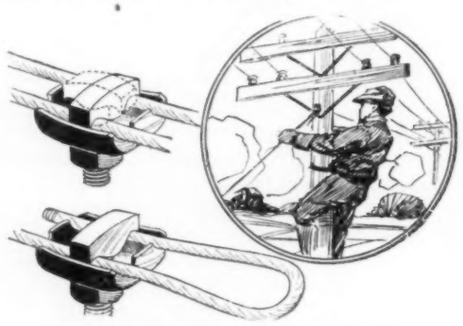
Hawk's Nest Built on Pole.

This is one of the peculiar sources of trouble not entirely avoidable which often happen to outlying lines.

Although this is a somewhat peculiar instance, yet similar cases are frequently found. The extreme height of the poles and the close net work of wires offer an exceptionally appropriate base for birds and squirrels to build their nests and breed in fancied safety.

Novel Clamp for Wire Cables

A LATE French invention offers a quick method of fastening wire cables to supports, as well as of splicing or making loops in them says *Popular Mechanics*.



Novel Clamp for Fastening Wire Cables.

A base, provided with a screw pin for inserting in the pole, is grooved so as to permit the insertion of the cable on either side of the central pivot. After the cable is in place, the turning of the pivot head locks the cable firmly in position. Thus either two cables may be secured or one cable may be looped and held by the same device.

Public Utility Commission News

Reports Concerning the Activities of State Regulating Bodies in the Telephone Fiela

Maryland

A LONG step toward constructive regulation of public utilities and betterment of service is being taken by Osborne I. Yellott, people's counsel to the Public Service Commission of Maryland. He is preparing for a uniform appraisal of the value of utilities, which will put the commission in immediate touch with every utility property in the state and lay the foundation for quick rectification of errors in rates, service and financing.

The plan, when completely in operation, will put in the hands of the commission, when any case is taken up, a complete and definite inventory of the property of the company affected, and so prepared that all items of value upon which agreement has been reached between the commission and the company will be set forth, and all items upon which there is disagreement, with the differences in estimated value as to each item.

Forms are being prepared in which will be entered each class of property owned by a utility, with the number of units of each class owned.

There will be three identical sets of forms. Upon one the utility will set down its property in detail; its estimate in detail of the original cost of the several units; its estimate of the reproduction cost, and its estimate of the present value. Upon another form the commission's engineering force will make its estimates, and, in the event that a complainant in a case should employ an engineer, there is another form for his estimates. After the companies' first appraisals are made, additions to property will be added upon the forms. Each of these forms being identical, the people's counsel in preparing his case and the commission in hearing it can immediately put a finger upon the issues between the opposing sides. This will enable the commission, when a case affecting property values is up, to go straight to the heart of the matter; when one affecting rates is up, to get before it in short order the property upon which the company asks a return in earnings; when one affecting financing by the company is up, to know whether money is needed for the things which the company may propose to buy.

Moreover, it will permit the commission to keep close tab on what the utilities are doing, how they are maintaining their property and what they are spending, and thereby permit it, on its own motion, to hold them to the highest feasible standard of efficiency.

In the past investigations into the corporations have been conducted upon varying plans. In each instance, however, the commission and the people's counsel in the beginning have had nothing to start from, no established facts as to property values. That made the investigations, of necessity, largely conflicts between the people's counsel and the counsel for the corporations as to what property values in given cases were. And because of the divergence of expert testimony as to these values, often the commission was somewhat at sea as to the truth.

Again, the diversity in form of the reports made by the several utilities as to their property has made it exceedingly difficult for the commission to conduct : general affirmative work for improvement in service.

Kansas

An attempt to do away with the free toll service among the different telephone exchanges in Osage county, Kansas, has stirred up a good sized telephone dispute that promises to make telephone history in Kansas by the time it is settled.

Application has been filed with the Public Utilities Commission by the Melvern Telephone Company, asking the commission to issue an order fixing the rates for toll service. Complaint is made against all the other companies, nine of them, in the county, that they are conducted on an unbusinesslike basis, and also that on account of this they are not furnishing efficient service to the public. In their answers, nearly all the other companies admit the charges, except for their service, which one and all maintain is good. On the other point, they express a willingness to have the commission step in and order them to make toll charges of from 10 to 15 cents per message, admitting that the present system of free tolls is unremunerative.

The Michigan Valley Telephone Company is an exception. Organized and owned by farmers in the neighborhood, it likes the free toll proposition. In a letter to the utilities commission, the president charges that the other companies are in collusion to add to the high cost of conversation, and that the attempt is to put the increase on the farmers. In its answer, the Michigan Valley company calls on the commission not to deal a "death blow to our free exchange system."

Briefly, the points in the Melvern Company's complaint are these: That none of the companies is able to keep its lines and exchanges in proper state of repair on account of the free and flat rates charged for toll service; that the higher rates charged by some of them against non-subscribers are unjustly discriminatory; that because of free toll service the lines are congested with trivial and useless messages, making it impossible to secure reasonably good service for business purposes. It is also charged that none of the companies is properly compensated for toll service. The complaint asks the commission to investigate and order such rates as it finds reasonable, just and remunerative. It also asks an order compelling the companies to put their exchanges and lines in good order.

Washington

The Washington Public Service Commission has issued an order forbidding telephone companies to exact a deposit from customers at the time of the installation of telephones and fixing October 27 in Seattle as the time and place for companies to protest against the ruling.

A second feature of the order provides that the companies may require the first month's telephone rental in advance, the telephone to remain installed and in use for 10 days following the close of the month before service may be discontinued in case rental is not paid.

The commission is having copies of the order made for distribution among the 160 companies affected, so that they may be familiar with its provisions.

Ohio

David R. Forgan, Edgar S. Bloom and Frank F. Fowle, receivers for the Central Union Telephone Company; and the Burton Telephone Company, of Burton; the Farmers Telephone Company, of Bloomville, and the Tiffin Consolidated Telephone Company, of Tiffin, are given the consent and approval of the Public Utilities Commission of Ohio to enter into a contract to continue an existing connection for an interchange of service between the Central Union Company and the independent companies mentioned.

The Greenville Home Telephone Company of Greenville is authorized to issue its preferred capital stock of the total par value of $200,000, to be sold for the highest price obtainable and for not less than par value, it being the finding of the commission that the money to be secured by the issue of said preferred capital stock is reasonably required for proper purposes.

The proceeds arising from the sale of said preferred capital stock will be devoted to and used for the following purposes:

The payment of the purchase price for the property of the Rossburg and New Weston Telephone Company, required by petitioner on March 28, 1910, $12,000.

The payment of the purchase price for the property acquired by petitioner under the order, made and entered April 9, 1914, in the proceeding entitled, "In the matter of the joint application of the Greenville Home Telephone Company and the Bloomer Home Telephone Company for the consent and approval of the commission to the purchase and sale of the property of the Bloomer Home Telephone Company," $3,575.

The payment of the purchase price for the property acquired by petitioner under the order, made and entered April 9, 1914, in the proceeding entitled, "In the matter of the joint application of the Greenville Home Telephone Company and the Bradford Home Telephone Company for the consent and approval of the commission to the purchase and sale of the property of the Bradford Home Telephone Company," $24,200.

The redemption and retirement of petitioner's present outstanding bonded indebtedness, $75,000.

Payment and discharge of petitioner's bills payable, $30,000.

The reimbursement of petitioner's income account for money expended therefrom for the construction of additions, extensions and improvements to petitioner's plants and property in the period ending with the year 1912, $55,225.

In the year 1905, defendant, the Valley Telephone Company, Lebanon, Warren county, Ohio, entered into some form of agreement to furnish telephone service to complainant, Chauncey R. Bunnell, and certain other persons associated with him, upon condition that complainant and his associates would construct a telephone line upon the public highway from Mills' Corner, a point to which said defendant had at that time extended its line and service, to the respective residences of said complainant and his associates, approximately two-thirds of one mile.

In 1911 the New Burlington Mutual Telephone Company had in contemplation the extension of its telephone line to Mills' Corner by way of complainant's residence, and not having sufficient poles on hand, entered into an agreement with complainant obligating itself to renew the said pole line constructed by complainant between his residence and said Mills' Corner, provided complainant would furnish the timber to make the poles necessary to renew the poles in said line requiring renewal.

The manager of the New Burlington Company renewed the pole line and placed its wires on it, and by agreement with Mr. Bell, manager of the said Valley Telephone Company, placed the wires of the Valley Company from Mills' Corner to complainant's residence behind the brackets on these poles. Since that time up to April 27, 1914, said defendant has been serving complainant over that line, and both telephone companies have been using the line in common from Mills' Corner to the residence of complainant.

During April, 1914, some person cut down one of the poles in the line. Complainant refused to renew the pole so cut down and defendant company cut the wires leading to complainant's residence, discontinued his service, removed the telephone from his residence and refused to furnish complainant further service.

The New Burlington Company, as soon as its attention was called to the matter, renewed the pole so cut down and promptly restored the line except the wires cut by defendant were not again connected. Defendant company says it was ready and willing to again serve complainant whenever the line was repaired, but it appeared that defendant neglected or refused to connect the wires cut by it necessary to such service.

It is the opinion of the commission that defendant cannot say who shall repair the line for complainant nor to what use the line is put so long as that use does not interfere with defendant's service. Defendant claims that it is its policy and rule not to extend its line more than five miles from its exchange, and that persons living more than five miles from its exchange and desiring service must build their own lines to meet defendant's line at such limit, when they will be served.

It appears from the tariffs of defendant as filed with the commission that defendant has no rule or regulation in such tariffs advising the public of such declared rule or regulation nor advising this commission or the public how or at what rate persons residing more than five miles from defendant's exchange may obtain service. Neither is the commission advised by any published rule of the past practice of said defendant as to such service.

The commission is, therefore, of opinion that complainant, Chauncey R. Bunnell, is entitled to have his service restored regardless of the ownership of said line in question and that it is the duty of defendant to connect the telephone wires so cut by it and attach such wires to the poles in said line, in condition to give adequate and proper service, and is so ordered.

California

The influence of the California State Railroad Commission extends far beyond the limits of its specified jurisdiction. It is bringing to the people of California benefits they would never have received but for its initiative.

To illustrate: Recently a certain Stockton man, desiring to have a telephone installed, was asked by the company for a deposit. He is a property owner and had resided in Stockton 35 years. He came to the record office and asked if he must deposit money for such a public utility service. He was advised to write to the State Railroad Commission. He did so. In a few days he received a reply pointing out that the commission could not act in Stockton, inasmuch as the city had not placed its utilities under control of the commission; but that the city council, having authority over utilities inside the city limits, could act on the matter.

As a result Councilman Sievers offered a resolution directing the city attorney to draft an ordinance prohibiting the telephone company from exacting deposits from patrons. The resolution was seconded and passed.

Kansas

The Kansas Public Service Commission has inferentially taken the position that the war tax of one cent on toll charges exceeding 15 cents may not be passed on to the subscriber by increasing the rate. Secretary Fred Coulson of the Kansas Independent Telephone Association brought the question informally before the commission.

Maine

The state of Maine is to have a public utilities commission with full jurisdiction over telephone companies, including their securities, rates, service, etc. Three commissioners appointed by the governor will serve for seven years at a salary of $5,000 for the chairman and $4,500 for the others. The act creating the commission was passed by the legislature in May, 1913, but has just been approved by popular vote.

Illinois

Mutual telephone companies operating in the state of Illinois and incorporated under the laws of that state are held to come under the jurisdiction of the Illinois Public Utilities Commission, in a ruling made by that body October 15.

Tuesday morning, October 27, the Illinois Public Utilities Commission held a hearing on the petition of the Desplaines Telephone Company, Desplaines, Ill., one of the few purely independent companies operating in the vicinity of Chicago, to sell a part of its system to the Chicago Telephone Company for $4,000.

The portion of the plant involved is that serving the suburb of Edison Park, which was annexed to Chicago at the last election. About 115 subscribers will be affected if the transfer is made, which appears reasonably assured. The city of Chicago was represented at the hearing by Messrs. Cummings and Kneisel of the City Telephone Bureau.

Wisconsin

Charles Epavier, a subscriber of the Oconto Rural Telephone Company, being alleged to have used his party-line telephone in a manner objectionable to the other subscribers, the company discontinued his service in February, 1914. The Wisconsin Railroad Commission has ordered a restoration of his service on the ground that the subscriber may not be deprived of his telephone indefinitely as a punishment; nor can the company allow itself to be governed by the dictates of those who refused to continue as subscribers if Epavier's service was restored.

Indiana

Owing to the great amount of preliminary work necessary before rate making can be entered into, it is expected the Indiana Public Service Commission will not take up the local telephone rate cases for hearing until early in 1915. The Indianapolis Telephone Company and the Central Union Telephone Company have filed appraisals of their plants with the commission.

Experts in the employ of the commission will now set to work drawing up a second appraisal of each plant and this will probably consume several months. The commission will then notify each company and the city of Indianapolis of this appraisal and an opportunity will be given the concerns or the city to file exceptions to the inventory. If such exceptions are filed the commission will then set a date for a hearing that all phases may be entered into so a fair value may be obtained on which the new rates will be based. If no exceptions are filed the commission will, on its own volition, order the hearing.

After the appraisal of each company has been ascertained to the satisfaction of the commission, hearings will be conducted on rate making. If a merger between the two companies is not effected it is believed the commission will order a physical connection of a nature to be worked out later.

New York

The New York commission has ordered the New York Telephone Company to cease charging more for rural residence service in the Valley Falls district than it does in the Jonesville district. The action is taken on the complaint of the Chamber of Commerce of the village of Schaghticoke. It was shown that under similar conditions the company charged $18 for service in Valley Falls and $15 for the same service in the adjacent territory of Jonesville.

Pennsylvania

The sale of the property of the Saltillo Telephone Company in Mount Union to the Bell Telephone Company of Pennsylvania has been approved by the Pennsylvania Public Service Commission, to take effect November 1. The property sold consists of extensions made since 1906, the Mount Union exchange having been leased that year by the Bell company to the Saltillo company.

A Woman Wire Chief

Portsmouth, Ohio, has the distinction of having one of the few women telephone wire chiefs. She is Mrs. Beatrice Colburn, wire chief for the Portsmouth Telephone Company. Portsmouth has a population of 30,000 and the local telephone exchange has an ultimate capacity of 3,600 lines, the present equipment being 1,800 lines, four-party harmonic, automatic ringing.

It is unusual to see a young woman in charge of a wire chief's desk, especially in a plant of this size, owing to the skill and experience required. It is seldom that a woman gets a chance to acquire the necessary training.

Her duties are to make all tests; give location of all trouble reported; direct the operations of from one to three outside men; keep the records of cable parts, both outside and inside of the exchanges, and pole line tests; the "move and change" records, to assign jumpers at the main, terminal and intermediate frames; give instructions for running bridge wires at cable boxes and make reports at regular intervals to the officials.

She refuses to become excited when the situation becomes trying, but uses her head and handles the case in hand diplomatically or with the iron hand as the occasion may demand, and it is said that her judgment is seldom in error. She gets results that make her popular with the officials.

A good horse is Mrs. Colburn's hobby and she spends much of her spare time with her driving horse, where she shows the same judgment that she uses at her desk.

The Law and the Telephone

How Telephone and Other Public Utility Matters Are Treated in the Courts

BY E. J. WENNER

IN 1903, the predecessor of defendant obtained permission from the owner of a farm to construct a telephone line across a pasture. The agreement provided that the company would place the wires on poles sufficiently high to prevent accidents, and to keep and maintain the line in that condition.

About sun-down on August 31, 1911, Willie F. Coen, plaintiff's nine-year-old son, went on horse-back to the pasture to bring in the cows. About twenty minutes thereafter the horse returned without the boy, and a sister went to the pasture in search of him. She found him in a draw lying on the ground on his right side, dead. She testified that a few minutes before the decedent started for the cattle she had talked with a neighbor over the telephone, and that after she returned to the house with decedent's body she tried to use the telephone and found she could not do so. Evidence showed the telephone wire to be broken. It appears from the evidence that the telephone wire had sagged in such a manner as to catch the horse and on that account the boy was thrown and killed.

Plaintiff brought action against the defendant for damages on account of the death of the boy and a verdict was returned in his favor in the sum of $1,750.00. An appeal was taken to the Supreme court on the theory that there was not sufficient evidence to show that the telephone wire was the proximate cause of the accident.

The Supreme court held that the evidence was sufficient to justify a finding that the horse came into contact with the wire, and that it wrapped around her limbs, causher to run away, and that in running she fell and killed the boy.

It was also contended by the telephone company that it was under no obligation to keep the wire at any specified height above the ground. The court held that it was its duty to keep the wire in safe condition; that the agreement was to construct and maintain the line in such condition that it would not be dangerous, and that in allowing it to sag, as was shown by the testimony, it violated a direct agreement of its grantor. The company was using the land without pay, and is held to the highest degree of care in the use of the property. It was bound to use more than ordinary care in the maintenance of its wire over and across the land occupied by the plaintiff.

The telephone company also contended that it was not obliged to keep the line in a safe condition until it had knowledge of a defect. The court held that it was the duty of the defendant to know the condition of its wire, and not to allow it to become sagged and in such a condition as would likely cause the injury complained of. The evidence shows that the wire had been in a dangerous condition for a long time before the accident occurred. The posts had been in place about eight years and they were constructed of two boards one inch thick and four inches wide nailed to short cedar posts. The company was bound to know that the wires were likely to get out of position and become dangerous on account of sagging. The evidence showed that four weeks before the accident plaintiff pointed out to defendant's line man the identical defect in the line which caused the accident, and insisted that a new post be put in to hold the wire in proper position. Therefore, the defective condition of the line was known to defendant for something like three or four weeks before the accident occurred.

This is a plain holding that a telephone company is obliged to maintain its wires in a safe condition, and it is charged with the duty of knowing whether the wires are safe or unsafe. If it has actual knowledge of their unsafe condition there can be no question as to its liability.

Coen v. *Central Telephone Company* (*Nebraska*), 146 *Northwestern Reporter*, 998.

STOCKHOLDERS OF TELEPHONE COMPANY—WHEN THEY BECOME SUCH—POWERS OF COMPANY—NOTICE—PURCHASE OF TELEPHONE LINES—VALIDITY.

W. E. Ege brought action against the Centerville Telephone Exchange Company in the Circuit court of Turner county, South Dakota, to recover a balance due on a promissory note. Plaintiff claimed that the defendant executed and delivered the note on or about January 1, 1907; that the note was given for $15,000.00 with interest at 7 per cent per annum and was due five years from date; that the balance due and owing plaintiff was $7,865.26 and interest.

The evidence showed that the defendant was incorporated shortly before the execution of the note in question, and that it was authorized to "sell, own, control, maintain, repair, improve and extend telephone exchanges and telephone lines, and to do all lawful acts in maintaining, promoting and carrying on said business." Immediately after its organization defendant purchased from the plaintiff the telephone exchange, properties and franchises known as Centerville Telephone Exchange. The note in question was given in settlement for the exchange. The defendant immediately started operating the company and also took over another concern known as Rural Telephone Company. Certain payments were made to apply on the note, leaving the balance as above stated.

The defendant interposed a general denial and alleged that at the time the note was executed and delivered to plaintiff no capital stock had been issued; that no stockholders' meeting had been held; that no officers had ever been elected; that no persons had ever been authorized to execute or deliver the note; that there was no consideration for the execution and delivery thereof, and that the payments made thereon had been made by the treasurer of the company without any authority so to do, without the knowledge, acquiescence or consent of the defendant. Defendant set up a counter claim and asked judgment against the plaintiff for such sums and interest as had been paid on the note. The plaintiff obtained judgment in the court below and an appeal was taken to the Supreme court.

The Appellate court held that no stock had been issued at the time of the execution of the note. A certain quantity had been subscribed for by the various individuals who had formed the corporation. These people assumed they were stockholders and were treated as such. The evidence shows that there was one stockholders' meeting held prior to the execution of the instrument, though no

stock certificates had been issued at the time. Many decisions were cited as holding that a stockholder becomes such by virtue of his subscription, in the absence of a provision requiring payment as a condition of membership, and that he may be such without the issuance of a certificate of stock.

Defendant's contention that it was not authorized to execute notes was belittled. The court held that the certificate authorized it to "do all lawful acts in maintaining, promoting and carrying on the said business," and that the giving of the note in question came within the powers delegated.

As to the payment of the money by the treasurer, the court said that these transactions had gone on over a period of some five years with the knowledge and approbation of the directors and officers of the corporation, and that all their acts had been ratified by the stockholders. Such being true, it seemed too late to raise a question as to the legality of the acts.

The decision of the court below was affirmed.

Ege v. *Centerville Telephone Exchange Company (South Dakota)*, 147 *Northwestern Reporter*, 70.

WISCONSIN STATUTES REGULATING TELEPHONE COMPANIES—RAILROAD COMMISSION—ORDER—REGULATIONS.

The state of Wisconsin has a law somewhat similar to that of the state of Michigan and gives to the Railroad Commission certain powers in the matter of regulating telephone and telegraph companies. It is provided that a telephone company must obtain consent from the Railroad Commission to sell its stock when it is proposed to purchase the property of another telephone company.

The Citizens Telephone Company at Eau Claire, Wis., petitioned the commission for permission to sell three hundred shares of common stock and two thousand shares of preferred stock to raise money with which to purchase the property and privileges of Chippewa County Telephone Company, which would enable it to conduct a local telephone exchange in the city of Eau Claire. The petition set out fully the terms upon which the stock would be issued and sold, and a schedule of the physical properties of the Chippewa company in Eau Claire. It seems that for many years the last named company had been engaged in conducting a local telephone exchange in Eau Claire in connection with its rural and long distance telephone business throughout Chippewa and Eau Claire counties and other parts of the state.

The hearing was held in June of 1913, and an order was made on July 30, 1913, denying the prayer of the petition of Citizens Telephone Company and refusing it permission to sell its stock for the purpose of purchasing certain property and privileges of the Chippewa company. An appeal was taken to the Circuit court in which it was asked that the order of the Railroad Commission be vacated, and that the prayer of the petition be granted. From a decree vacating the order of the Railroad Commission and giving the Citizens company permission to sell its stock, an appeal was taken to the Supreme court.

The Supreme court's opinion sets out the facts somewhat at length and discloses that the Chippewa company had permission to conduct a local business in Eau Claire as a part of its system, and that such permission was granted in the spring of 1905. The franchise provided that if the company at any time assigned or sold its interest to the Wisconsin Telephone Company, or combined with it, the rights granted thereunder should become null and void.

The Chippewa company had been engaged in the furnishing of rural service and had arrangements for connections with various local and long distance telephone companies. The local business done by the Chippewa company was confined almost exclusively to the transfer of calls to the local exchange of the Wisconsin Telephone Company.

The court decided that under the evidence the Chippewa company did not operate a local exchange in the city of Eau Claire within the meaning of the provisions of the law, and that the finding of the Railroad Commission was proper and sustained by the facts shown. Such being the case, the Circuit court was in error in reversing the ruling of the commission.

From the above it will be seen that the Railroad Commission has authority to pass upon the facts, and if it is convinced that the company is not engaged in local business within the meaning of the statutes, it has the right to decline the permission request. It seems that the object of the law is to favor consolidation of telephone companies where advisable, but at the same time safeguard the interests of subscribers and the people in general.

Citizens Telphone Company of Eau Claire v. *Railroad Commission of Wisconsin (Wisconsin)*, 146, *Northwestern Reporter*, 798.

An action similar to the Hanson case, used in these columns last month, though different in the facts, was brought by Gustav Schmitt against Western Union Telegraph Company. Iva Schmitt, plaintiff's eight-year-old daughter, had lived in the orphans' home in Hoyleton, Ill. She became ill of blood poisoning on August 14, 1912, and on August 24 at 9:45 o'clock a. m. the superintendent sent plaintiff a telegram informing him of her sickness. The telegram was addressed to plaintiff in care of Rural Route 4, Rockwell City, Iowa. The telegram reached Ft. Dodge, Iowa, at 12:45 o'clock a. m. and an effort was made to reach plaintiff at Rockwell City, Iowa, by telephone. Defendant's line did not extend beyond Ft. Dodge, Iowa. The telephone operator at Rockwell City reported that no one of that name was on Rural Route 4, also that she had inquired at the post office, hotel and public places, but could find no such person. The operator at Hoyleton was then asked for a better address and they were directed to deliver it to Rural Mail Carrier Route 4. At about 10:35 o'clock a. m. of the day following a telegram was sent informing plaintiff of the death of his daughter. Both messages were mailed from Ft. Dodge to the plaintiff at Rockwell City, and were delivered to him at the home of Frank E. Conrad on Rural Route 4 at one o'clock p. m. on the 26th of August. The funeral occurred in Hoyleton at two o'clock p. m. on the 26th of August.

Action was brought by the plaintiff against the defendant to recover damages on account of mental pain and anguish because of its negligence in the delay of the telegram. Recovery was had in the court below, and the defendant appealed to the Supreme court. It claimed there was no unreasonable delay in the delivery of the message.

The Supreme court held that the question of whether the delay was unreasonable was properly before the jury, and that the facts should have been submitted to them as had been done. The address given in the telegram showed that the addressee lived beyond the defendant's

line, and if it accepted the message, it was in duty bound to deliver the same in a reasonable time. The evidence showed that had the defendant made inquiry at the post office or of the rural mail carrier on route four in Rockwell City the telegram could have been delivered immediately. The postmaster testified that no inquiries had been made at his office. He also testified that both he and the carrier knew plaintiff and knew where he could be found, and where the message could have been delivered to him. The decision of the lower court was affirmed.

This case is authority for the statement that a telegraph or telephone company is bound to deliver a message to the addressee without unreasonable delay. If it accepts a message to a point not on its lines it is not excused from delivery within a reasonable time. It is bound to make at least a reasonable effort to locate the addressee and deliver the message to him without delay.

Schmitt v. *Postal Telegraph Company* (*Iowa*), 146 *Northwestern Reporter*, 467.

CONTRACT MADE OR RATIFIED BY TELEPHONE—VALIDITY—OFFER—ACCEPTANCE.

The plaintiff, Dudley A. Tyng & Co., is an Illinois corporation engaged as a stock broker in the city of Chicago. It buys and sells corporation stocks, bonds, etc. The defendant, Converse, is a resident of Jackson, Mich. On March 31, 1911, the defendant sent to plaintiff a letter wherein he stated that he would buy any part of fifty shares of stock in American Fork & Hoe Company at $138.00 per share. The plaintiff answered the letter, saying it could not immediately deliver the stock at that price, but would keep the offer open until canceled. Between April 5 and 8 Mr. Andrews of the plaintiff company had a telephone conversation with the defendant over the long distance telephone. This conversation related to twenty-eight shares of the same stock which defendant had bought through plaintiff at $145.00 per share. Mr. Andrews asked defendant if he wanted to cancel his order for fifty shares and he claims defendant asked that it be allowed to stand, and that he would be glad to take all he could get at any time at that price. On April 19 the plaintiff telegraphed defendant that it had sold him fifty shares at $138.00 per share, and that it could supply fifty more at the same price. Defendant telegraphed that he had all he could handle and could not accept the shares in question.

Some correspondence was had, and after defendant absolutely refused to accept the stock, plaintiff sold it at $120.00 per share and brought action against defendant to recover the difference. In the lower court plaintiff was successful.

Defendant contended that the letter of March 31 was a present offer to buy and that to make it a binding contract it would have been necessary for plaintiff to accept the offer without terms or conditions, and that the letter was not an acceptance. Plaintiff contended that the letter and the telephone conversation created an offer or standing order, which was accepted when plaintiff notified defendant it had sold him the stock as per open order.

Commenting on the evidence the court refers to the letter written by defendant shortly after receiving the telegram wherein he states he is sorry he did not cancel his order. This is held by the court to be an admission that the order was open, and that to make a completed contract there should have been an acceptance by plaintiff.

It became necessary to inquire into the question of the validity of the contract made by telephone, and in the opinion the Supreme court quotes at considerable length from Elliot on contracts wherein it is stated that "contracts may be consummated by means of telephonic conversation." Cases are cited to the effect that when a person places himself in connection with another by means of the telephone system he thereby invites communication relative to his business through that channel. The court observes that contracts made by telephone are as effective and binding in law as if made verbally between the parties standing face to face and carrying on the conversation which culminates in the contract.

As to the place of the contract, the court holds that in the absence of other controlling facts, the law of the place of answer governs the agreement. In the instant case the court holds that inasmuch as the contract was accepted by Mr. Andrews in Illinois, it is governed by the laws of that state.

The judgment of the court below is affirmed.

Dudley A. Tyng & Co. v. *Converse* (*Michigan*), 146 *Northwestern Reporter*, 629.

Iowa Telephones Show Increase

Iowa has one telephone for every 5.83 persons, according to the telephone and telegraph report for 1914 being sent out from the capital by A. H. Davison, secretary of the executive council. There is a big increase over 1913 in the number of stations served by telephone companies, but the net assessment of the companies is a trifle less.

In 1913 Iowa had 187,809 telephones in cities and 152,103 telephones in the country, which makes a total of 339,912.

In July, 1914, the number had increased to 216,114 in cities and 165,322 in the country, a total of 381,436. While the number of subscribers in cities increased 28,365, the rural telephones increased 13,219.

The net assessment of all Iowa telephone lines in 1913 was $4,612,333. In 1914 the assessment was $4,544,461.02, a decrease of $67,872.91.

There are 4,270 telegraph stations in the state and 1,331 toll instruments. The pole mileage is 89,741, compared with a mileage of 87,919.96 for all lines in 1913. The gain was small.

The Iowa Telephone Company is the largest telephone company in the state, operating in practically every county. There are more than 400 independent telephone lines. The Iowa Telephone Company has 78,658 city subscribers, 6,680 rural patrons and 820 toll stations.

It has 9,619 miles of line, valued at $140 per mile, a total of $1,346,737. The Western Union has 7,323 miles, valued at $80 a mile, a total of $585,850. The Postal has 1,278 miles, valued at $71,910. The American Telegraph & Telephone Company has property valued at $119,556 in the state. According to this report, the independent companies own more than half of the telephone equipment in the state.

The "Protective Tariff Cyclopedia" in abridged form has just been issued by the American Protective Tariff League, New York. The volume as issued consists of the Underwood and Payne-Aldrich Tariff Laws carefully compared, giving every rate of duty in both laws and completely indexed. The book consists of one hundred and sixty pages.

Recent Telephone Patents

A Brief Digest of those Current Specifications Most Interesting to Telephone Men

U. S. PATENT No. 1,078,690. For Improved Automatic Telephone System. Issued to Frank Newforth, Jr., Chicago, Ill., assignor to Automatic Electric Company, Chicago, Ill. A detail of improvement introduced into the Strowger system of automatic telephones, providing for the removal of the line relay from the called line at a considerable interval of time before the called and calling lines are connected together.

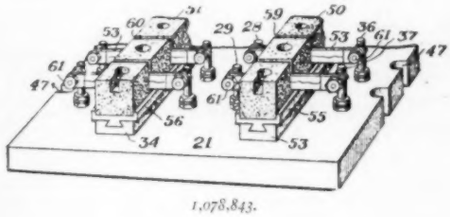
1,078,746. Amplifying Case for Microtelephone. W. B. Oliver, Collingswood, N. J. The case serves as a carrying case for a pocket telephone set and at the same time has the form of a sound concentrating funnel for the transmitter element.

1,078,772. Subscriber's Call Register. H. P. Clausen and W. T. Curtis, Chicago, Ill., assignors to Samuel C. Scotten, trustee, Chicago, Ill. An improved detail for call register of the type in which the reading of the dials may be taken over the telephone line, a traveling contact maker being arranged to pass over projections upon the dial wheels and to give telegraphic signals varying according to the varying numerical positions of the dials and wheels.

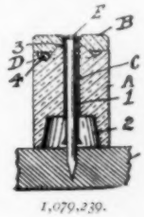
1,078,843. Protector. Thomas B. Farmer, Baltimore, Md. Application filed November 22, 1909. The protected line conductor is carried through fuse wires mounted at sparking distance from earthed carbon blocks. Excessive sparking to earth thus immediately heats the fuse wire at the point of sparking.

1,079,123. Telegraphone. J. H. J. Haines, New York. Two records are made, one with each end of the recording magnet.

1,079,156. Limiting Register. William Aitken, Liverpool, England. A call counter for telephones, which may be set to



1,078,843.



1,079,239.

register a limited number of calls, operating them to display a signal when the prepaid calls are nearly exhausted and to disable the telephone when the prepaid calls are entirely exhausted.

1,079,239. Insulator. J. R. Harris, Crafton, Pa. A two-part porcelain knob has its two parts held together loosely by a tube, the end of the tube being spread to keep the insulator parts from slipping off, and the nail or screw for attaching the insulator passing through the tube and then clamping both parts.

1,079,472. Crank Arm. E. B. Craft, Hackensack, N. J., assignor to Western Electric Company, New York. Filed July 14, 1909. The crank arm, for a magneto hand generator, is made of sheet metal, pressed into desired shape.

1,079,533. Telephone Hook Switch System. William Aitken, Liverpool, England. A pair of double-pole key switches are mounted in the telephone and are associated with the hook lever in such manner as to ensure proper restoration of the key switches when the telephone is replaced upon the hook after conversation.

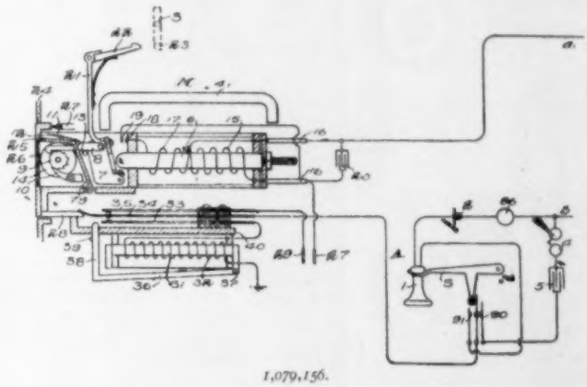
1,079,538. Antiseptic Attachment. A. B. Buckland, Rochester, N. Y. An attachment of ring shape to clamp upon the telephone mouthpiece and to contain an antiseptic.

1,079,760. Answering and Recording Telephone. C. J. Gustafson, Aberdeen, S. D. A combination of telephone line, subscriber's telephone set, and recording and speaking phonographs, with mechanism to start the phonographs when a call is rung upon the line, and to continue them in operation for a short period.

1,079,931. Microphone. J. J. Comer, Chicago, Ill., assignor to Automatic Enunciator Company, Chicago, Ill. A telephone transmitter having a differential carbon cell. Two carbon electrodes are clamped to the center of the diaphragm, upon the two sides of the diaphragm.

1,080,018. Police System. Louis W. Miller, Rochester, N. Y., assignor to National Police Signal Company, Buffalo, N. Y. The particular feature of the telephone system is that when a call is made from a substation telephone an automatic time stamp at the central office records the time at which the call was made.

1,080,130. Cable Hanger. John J. Walsh, Yonkers, N. Y. The cable hanger has a saddle for the messenger wire and a ring for the cable, one end of the cable ring passing through both ends of the messenger saddle.

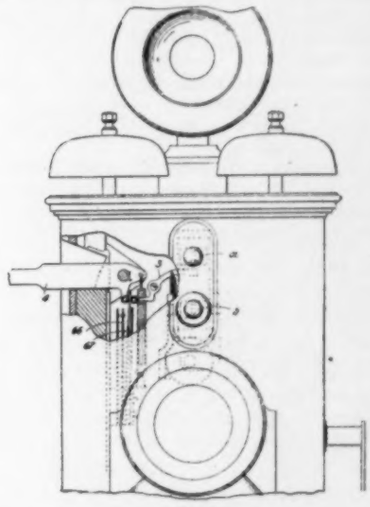


1,079,156.

1,080,251. Duct Clearing Device. Maurice Blumenthal, Brooklyn, N. Y. A "jar-rod" the head of which comprises a sleeve and a rod movable through it.

1,080,260. Intercommunicating System. P. J. Burgess, Jamaica, N. Y., assignor to General Acoustic Company, New York, N. Y. A system of intercommunication circuits and keys designed particularly for use with dictagraph circuits.

1,080,871. Key Switch. J. N. Wallace, La Crosse, Wis., assignor to Western Electric Company, New York, N. Y. The key is a strip mounting key frame, comprising a web plate, upon which the switch springs are mounted, the web plate being slotted for each key and the plunger engaging the edges of the slot and being guided thereby.



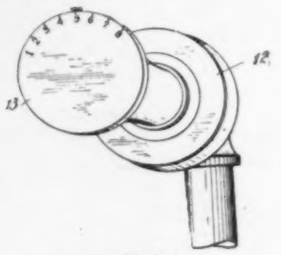
1,079,533.

1,081,128. Automatic Telephone Exchange. Frank A. Lundquist, Chicago, Ill., assignor to Western Electric Company, Chicago, Ill. Application filed February 1, 1905. This is a testing system for automatic telephone systems in searching for an idle circuit. Three magnets are used, two of which act together as vibrators to advance the switch, while third acts as a test magnet to stop the switch when an idle circuit is found.

1,081,300. Method of Testing Electrical Conductors. H. M.

Friendly, Portland, Oregon. The voltmeter as a device for making rapid measurements upon telephone lines is developed in this patent. The movement of the meter is double wound and circuits are provided for opposing the currents in the two windings with the line under test in series with one winding and an adjustable resistance in series with the other winding for making null or zero readings. The voltmeter may be used also in the usual direct manner of reading.

1,081,368. Automatic Selector Mechanism. E. B. Craft and



1,083,569.

A. F. Dixon, New York, N. Y., assignors to Western Electric Company, Chicago, Ill. Application filed January 11, 1908. Mechanism is provided for driving wipers by motor power over field contacts, and stop devices determine the position of stop of the wipers, the stop devices being brought into action by mechanical co-operation of the movable and controller members of the switch.

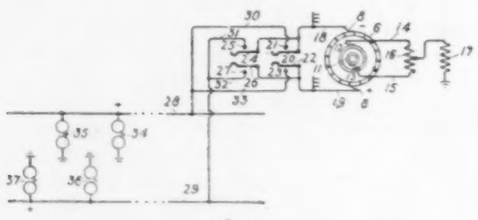
1,081,493. Antiseptic Attachment. E. M. Doeringer and A. C. St. Marie, San Francisco, Cal. A cone contains an antiseptic material and has lugs for gripping the perforated plate of the transmitter funnel.

1,081,572. Signaling System. Henry Bewlay, Newark, N. J., assignor to Western Electric Company, New York, N. Y. In a generator of ringing currents for operating selective biased bells from the line wires to earth, the permanent earth is applied at the ringing generator by bridging the primary winding of an induction coil across the generator slip rings and then connecting the middle point of that primary through its own secondary winding to earth.

1,081,712. Telephone Switch. W. P. Andrick, E. Lowe, and H. W. Haff, Jamaica, N. Y., assignors to General Acoustic Company, New York, N. Y. Within the telephone set are two sets of switch springs and a lever for working either of them, with a detent for the key lever, and a connection from the telephone hook lever and a lost-motion connection, for releasing the key lever detent when the telephone is hung upon the hook.

1,081,990. Telephone Indicator. T. L. Savin, Pine Bluff, Arkansas. The operation of the call bell starts a motor which lifts the switch hook lever, operates a phonograph to speak into the telephone transmitter, then depresses the hook lever and comes to rest ready for repeating upon the next call, "whereby information which the subscriber desires to communicate is conveyed to any person calling his station."

1,082,248. Condenser Telephone. Josef Unterholzner, Zweibrucken, Germany. A telephone receiver having a speaking diaphragm and electrically charged diaphragms near it, the speaking diaphragm being imperforate and the others perforated.



1,081,572.

1,082,289. Receiver. Michael Setter, Chicago, Ill., assignor to First Trust and Savings Bank, trustee, Chicago, Ill. Application filed March 12, 1906. This is one of the early applications involving the use of a cup containing the electromagnet spools of the receiver and having the receiver diaphragm as a closure or cover to the cup, the cup being enclosed within an outer casing with screw cap, but being in substance a complete receiver mechanism before being enclosed in its outer case.

1,082,310. Relay. John Erickson, Chicago, Ill., assignor to Automatic Electric Company, Chicago, Ill. A relay of the bell-crank armature type with an adjustment by which the angle of the bell crank may be changed.

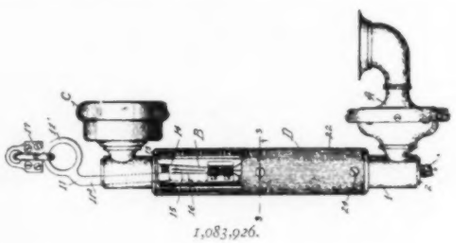
1,082,856. Telephone Hook Control. John Frith, Bridgeport, Conn. Where a special holder for the telephone receiver is used, the receiver sometimes is not able to control the hook lever. This patent shows a device for holding the hook lever up or down as desired, independently of the receiver or special receiver rest.

1,083,256. Private Line Telephony. Isidor Kitsee, Philadelphia, Pa., assignor to American Telephone and Telegraph Company, New York, N. Y. Application filed April 24, 1907. A common battery line having at each telephone a series single stroke bell with magnets constantly charged by line current when the line is not in use. A key at each station may tap signals upon all call bells. When the telephone is used, the line battery supplies speaking current.

1,083,406. Telephone Desk Set. H. L. Knight and B. W. Sweet, Cleveland, Ohio, assignors to Century Telephone Construction Company, Buffalo, N. Y. Application filed April 19, 1906. This is an early application, and the patent contains broad claims, upon a tubular skeleton standard having switch parts mounted upon the skeleton frame and having removable fittings about the standard to render the switch parts accessible.

1,083,456. Translating and Selecting System. E. C. Molina, Boston, Mass., assignor to American Telephone & Telegraph Company, New York, N. Y. Application filed April 20, 1906. A translating system in connection with Automatic Telephone Switching, containing devices for receiving groups of electrical impulses, and for transmitting groups in a relation different from that of the groups received.

1,083,569. Telephone Lock. H. Van Hoevenberg, North



1,083,926.

Elba, N. Y., and R. W. Pope, Elizabeth, N. J., assignors of part to W. J. Spain, New York, N. Y. A body member of the lock is placed over the body of the transmitter mouthpiece and a hinged cover plate closes the mouthpiece so that the transmitter cannot be used. The cover plate serves also as a dial for the combination of the lock, the plate being turned according to a combination and then lifted when the transmitter is to be used.

1,083,671. Antiseptic Attachment. Thomas Duquette, Sr., North Grosvenor Dale, Conn. A spring ring for clamping around the edge of the transmitter mouthpiece carries a hinged flap or cover for the mouthpiece. Upon the inner surface of the cover an antiseptic chamber with a porous cap is placed.

1,083,755. Insulating Material. J. C. Peabody, Boston, Mass., assignor to the Republic Manufacturing Company, Boston, Mass. An insulating material which consists of paper fiber and free or uncombined resin, the resin being distributed uniformly over the surface of the fibers composing the mass, and the whole being rendered solid by heat and pressure.

1,083,788. Loud Speaking Receiver. Charles Adams-Randall, Boston, Mass. The receiver is a box-like resonator. Forming a portion of one side of the box is the diaphragm, composed not of a sheet of magnetic metal but of a number of wires of different diameters. Within the box are the telephone magnets. The distance from the diaphragm to the magnets is adjustable.

1,083,917. Timing Device. William Bryce, Bristol, Conn., assignor to E. R. Johnson and C. L. Brancher, Cincinnati, Ohio. A simple device for stopping and starting a watch movement. A lever may be turned to lift a brake from the balance wheel, the lever carrying also a contact finger to start the oscillation of the balance wheel.

1,083,926. Microphone Hook Switch. Lawrence Ericson, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company, Chicago, Ill. A microphone having the usual handle, transmitter and receiver, with switch in the handle, and a switch hook pivoted in the handle and adapted for hanging the microphone upon a support, the pivoted hook member operating the switch when the microphone is hung up.

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

"Dividend Earning" Central Office Equipment

Dividends is the prime consideration when selecting equipment for a new central office. The exchange manager has not only dividends in mind, but continuous dividends when he investigates the details of the several systems at present on the market. The service must, above all, meet the demands of the exacting patron. Good commercial service, however, may be rendered by a system requiring a comparatively low initial investment associated with a recognized high cost of operation, or by a plant requiring a considerable initial outlay with a claimed low cost of operation and maintainance. The problem of weighing one system against another as regards interest on investment, operating, maintenance and depreciation charges takes considerable patient study, even though accurate operating data be available.

The Texas Independent Telephone System, with headquarters at Waco, some months ago determined to install a new central office equipment at Port Arthur, Texas. After a characteristic study, it was decided to install a lamp line multiple, double cut-off relay switchboard embodying the latest ideas for efficient operation. The cord circuits were perhaps the outstanding feature of the company's requirements. They were to be provided with four party harmonic, machine ringing so designed that the subscribers' bell would be automatically rung two seconds out of every seven until the receiver should be removed from the hook, the operator only being required to depress the proper key once. In addition, the operator was to be automatically connected with the subscriber upon inserting the answering plug into the jack, and disconnected upon depressing the ringing key. Ringing supervision and the movements necessary in operating the listening key were in this way eliminated. Listening keys, however, were to be supplied for use when special supervision was necessary, such as upon "operator recalls." With the above features, it was believed the load could be rapidly handled on a minimum number of operators' positions, thus cutting down the investment in switchboard sections and multiple jacks. The operating charges were seen to be low, no complicated circuits introduced high maintenance, and the initial expenditure appeared wholly consistent with the demands of modern service.

The Port Arthur Operating Room.

The installation of the new office at Port Arthur has recently been completed and the test of service is proving the type of system chosen by the company officials a wise investment. The Stromberg-Carlson Telephone Manufacturing Company, of Rochester, N. Y., secured the contract and installed the apparatus ready for operation.

Front View of Regular Subscriber's Section Before Installation.

We present herewith a view of the operating room of the new Port Arthur office. The initial installation included three six-panel sections of rigid iron frame construction encased in mahogany. The usual precautions were provided against the spread of fire, steel bulkheads being inserted between adjacent sections. Asbestos fire screens also isolate the multiple from the lower portions of the board. Each section has an ultimate capacity of 4,800 multiple subscribers' lines with 1,000 lines equipped. The answering space is equipped with 100 lines per panel throughout the regular subscribers' positions, the answering jacks being mounted twenty per strip.

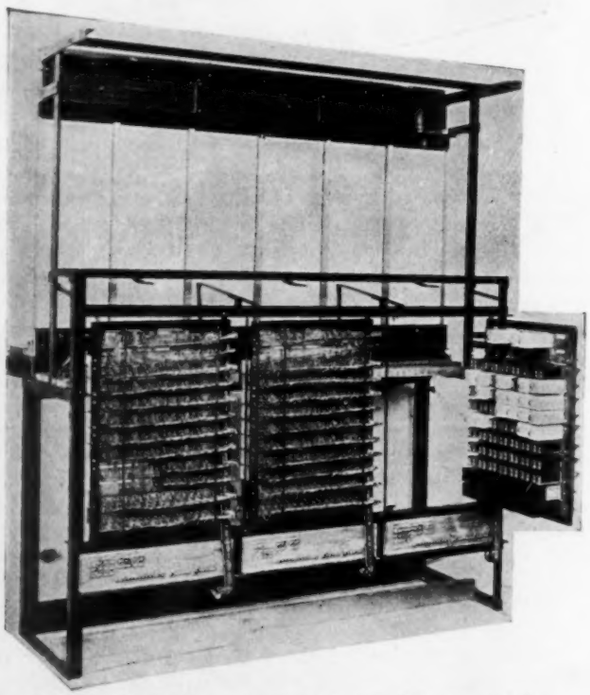
The first section of the board is reserved for the toll and recording service, and the wire chief's plugging up trunks. In addition to the standard toll to toll circuits the toll positions contain a number of universal cord circuits, by means of which all toll to local connections are put up as well as toll to toll or local to local when required.

A regular operators' equipment comprises 16 cord circuits of the type previously described, operators' telephone circuit, eight order wires with an ultimate of sixteen, generator circuit, line and cord test circuit, supervisory pilot and one line pilot lamp per panel. The method of mounting the operators' circuit apparatus, as well as the steel frame construction may be observed from the front and rear views of a regular subscribers' section taken before the work of installation began. All cord relays and condensers, as well as other auxiliary operators' circuit apparatus, are mounted on hinged gates. This construction renders both the terminal and adjustment end of the relay accessible and at the same time exposes the cords compartment.

To the right of the operating room view may be seen the combined chief operator and information desk. The first position contains the usual monitoring and supervisory circuits and also a full complement of trunk circuits so that the chief operator may also serve as an information operator when desired. The second position has no supervisory circuits and is designed as the regular information position.

Directly below the operating room is the terminal room. The initial main distributing frame, of the usual construction, consists of nine verticals, each vertical designed to mount two hundred Cook No. 10 protectors. On the horizontal side are ten shelves with a capacity of 2,000 lines. The intermediate distributing frame is of quite similar construction, and initial framework was furnished for 1,600 sets of line relays.

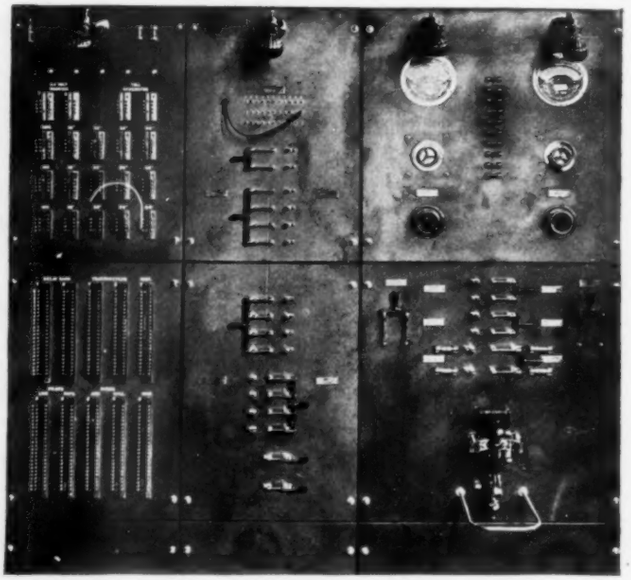
The location of Port Arthur on the Gulf of Mexico is one for which telephone apparatus must be built with especial precautions against dampness. All relay and other coils were wound with wire which was enameled



Rear View of Regular Subscriber's Section Before Installation.

in addition to the regular insulation and the coils, after winding, were impregnated in a special insulating compound. All cables, moreover, were made up of enameled wire with double silk and single cotton servings and the cores saturated in beeswax.

The current for this plant is derived from a storage



Power Board at Port Arthur.

battery consisting of eleven Electric Storage Battery Company's type F-11 lead-lined wooden tanks, and F-7 elements equipped. Two sets of smaller booster batteries are also employed alternately in series with the main battery in raising the potential to 48 volts on toll conversations. The batteries are charged from a 40-ampere General Electric Company's mercury arc rectifier. As a reserve unit a Fairbanks-Morse special vertical gasoline engine belted to a Roth 30 volt, 1¼ kw. charging generator has been installed.

A Holtzer-Cabot four frequency vibrating converter with duplicate sets of vibrators and transformers furnishes ringing current. A motor-driven Stromberg-Carlson interrupter completes the ringing and other circuits as necessary for the machine ringing feature. The various power circuits are controlled and distributed from a Monson slate power board shown in the accompanying view. Upon the panel to the right are mounted the various battery and charging switches, Weston meters and I. T. E. circuit breaker. The middle panel mounts the ringing switches and at the top are seen the jacks and plug for obtaining individual cell test readings on the three batteries. To the left is the distributing fuse panel equipped with indicating alarm fuses and pilot lamps.

Australia Requests Bids for Switchboards

The Imperial Trade Correspondent at Brisbane, Australia, reports that tenders will be received at the office of the deputy postmaster general, Brisbane, until December 15, for supply of an automatic or semiautomatic switchboard, together with associated apparatus (schedule 291), and a common-battery multiple switchboard (schedule 290). Copies of the specifications and conditions and forms of tender may be obtained from the office of the deputy postmaster general, Brisbane.

Switchboard in the Moxham Exchange of the Johnstown Telephone Company.

Kellogg Switchboard Service at Johnstown

By Edward I. Pratt

In 1901 a Kellogg common battery switchboard was installed in the city of Johnstown, Pa., which upon a careful examination recently completed of the original apparatus, is found to be in a marvelous state of preservation. Comparison with this original equipment and new apparatus is easy, because in the first part of this year, the key shelf, keys and operator's set were removed and additional lines added to each operator's position giving a total of 200 lines to each position. The average is 320 telephones. These changes were made by the installation of the new Kellogg automatic recall system. Careful examination of this switchboard today shows the old apparatus so good in appearance with very little wear, that if the observer did not know, he could hardly tell the old from the new.

There are few telephone men in this country who do not know Ed Schade, general manager of the Johnstown Telephone Company, at least by reputation. Mr. Schade is plain spoken; he says just what he means, and means what he says. He is fearless, honest and unpretentious, and a good fellow. His hobby is the Johnstown, Pa., exchange, and it occupies the most of his waking thoughts. Similarly nearly everyone in Johnstown knows Mr. Schade, because of his keen personal interest in the success of the telephone installation from their standpoint.

Quite recently a lady telephoned Mr. Schade, and while declining to give her name, complimented him on the service, but asked him what she was to do when her telephone rang while she was in the kitchen frying pancakes.

"Get an extension," he promptly replied.

It has not been all easy sailing for the Johnstown Telephone Company. Mr. Schade, in the last two years, has passed through a competitive fight, the equal of which has hardly been seen in this country, or elsewhere. Yet his switching plant is today on a firmer foundation, more progressive and better thought of, than many other exchanges of similar size. In this extremely strenuous competitive struggle, Mr. Schade had to combat everything from third-rate telephones, almost a telephone free with every drink, up to captive advertising balloons, which day and night promised everything in the category of exchange evolution.

The Operating Room of the Johnstown Exchange.

An imposing regiment of soliciting experts availed naught, and the opposition faded away, leaving the Johnstown exchange with a greater and growing subscribers' list. The people this year noticed, by reason of improved service, when the change to the automatic recall switchboard was made. Every operator has been giving better service to the subscribers, handling a greater amount of calls per unit of time, and with less confusion and useless back and forth questioning between operator and subscriber, than was essential under the old systems. Johnstown subscribers approve highly the efficiency of the new system, with its unique combination of telephone economies, such as automatic ringing, automatic listening, instantaneous recall, instantaneous disconnect, secret service and automatic peg count, which are proved practical by the dependable operation of this switchboard of the Johnstown company.

The 12-Year-Old Johnstown Service Desk.

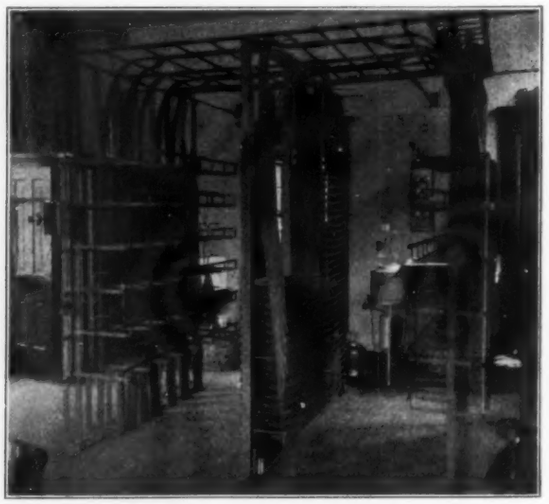
General Manager Ed D. Schade in His Office.

Those who have examined the board have been much surprised that all its parts could have stood up so well through long years of hard service. Every bit of the original installation that could be used was retained in changing to the new automatic recall system. The substitution of chest plate transmitters, for instance, showed Mr. Schade that a good way to fill up the holes where the original transmitter cords were, was to use them for pilot lamps. This was done, and the scheme has been found most satisfactory.

Charles Griffith, or "Doc" Griffith, as he is affectionately addressed by his friends, has stood firm all these years with Mr. Schade as a champion of the Kellogg common battery switchboard. The equipment is in charge of staunch admirers, and J. P. Carliss, superintendent of the company, heads a very loyal corps of workers, that helps to keep things humming.

The switchboard at the Moxham exchange of this company, shown in the accompanying illustration, is a small unit, which is a model for efficient arrangement and good service. Sometimes telephone managers do not like to have their switchboards photographed, unless every position is occupied by an operator, and will object to a board not filled up, regardless of what the usual load is and how it is handled. Some managers will insist on hurriedly securing some girls from the office to fill vacant chairs, fearing that a photograph of their switchboard not filled with operators will indicate lax methods somewhere about the plant. Visitors may say, when they are shown the pictures framed on the office wall, "But you cannot give your subscribers the right kind of service with so few operators."

Modern Methods Are Applied in Johnstown.



Terminal Room of the Moxham Exchange.

The Kellogg automatic recall system is changing this altogether. Now, managers take an actual pride in

showing their board, just as it is, under an average load. They do this, knowing well that, whether they have vacant chairs in every section or not, the girls at the board are working efficiently because they are uniformly employed—not driven but just comfortably busy, all the operators handling all the calls at the same speed, giving every subscriber the same prompt and efficient service.

The equipment of the Johnstown Telephone Company is as complete out of the exchange room as within, as indicated by one of the accompanying illustrations, taken at the entrance of the storeroom. The car in the foreground has seen service for some six years, and is in excellent condition. In addition, there is a smaller one-seated car, both of which save time and vastly increase the efficiency of every employe using them.

Much of the outside construction of this exchange is unique, owing to the unusual arrangement of the houses in many districts adopted when Johnstown was built after the great flood. Not dreaming of how the city would spread out as it has done of late years, the inhabitants along miles of streets have built, so to speak, a double row of residences, one in front of the other. These houses are not very large, and the yards sur-

Office Force of Johnstown Telephone Company.

rounding them do not seem to be stinted as the result of this apparent dividing of the lots. It gives, however, a wonderfully economical and satisfactory pole arrangement. The pole in each block serves in many squares practically twice the number of subscribers as in the average city street.

Underground Telephone for War Service

The *London Times* quotes a report, attributed to an Austrian lieutenant, who, when about 18 miles from Lublin, gave orders to his men to lie down and rest. "All at once," he says, "I saw that a corporal, who had lain down to sleep about 400 paces from me, sprang up, and by all kinds of gestures tried to communicate something to me and finally made a sign to me with his finger to go to him. Naturally, I understood nothing of what he meant, and thought at first that the man had lost his reason through great fatigue. When I reached him he whispered to me that while he was on the ground he had heard some one calling without being able to see anyone. He had only understood the word 'Hallo!' Thereupon I lay down on the ground and heard quite clearly 'Hallo! Hallo! . . . Hallo, Lublin!' and, in between, Russian curses. I stood slowly up, and saw a few yards in front of me a heap of beetroots covered with some earth such as could be seen regularly at distances of about 100 yards. This heap before me was close up against a large shrub, and when I examined the thing a little closer, I observed a small wooden door in a hole next to the shrub, which, beyond question, was the entrance to a subterranean excavated passage. I had the heap surrounded, and then kicked the door in. Three peasants sat there in a space of about 2 yards square, with a field telephone. They were two underofficers of a field telephone detachment and an officer of the general staff, who was charged with the duty of informing his chief in Lublin of all the movements of our troops. We had only discovered the telephone office through an accident, for the door and the hole in the ground were so well concealed by the bush that apparently we should have marched past them without the slightest suspicion."

Automatic Service for Argentina

The Automatic Electric Company, Chicago, Ill., through the Automatic Telephone Manufacturing Company (Ltd.), of Liverpool and London, is installing 5,000 lines of automatic equipment at Rosario, Argentina, under the supervision of American experts. The new system will it is stated, go into operation about the close of this year. A similar installation for 2,000 lines was inaugurated at Cordoba in March, 1914, and is said to be giving excellent results. The automatic service is especially adapted to cities like Rosario where the important foreign element experiences more or less difficulty in obtaining certain numbers owing to faulty pronunciation.

Both the Cordoba and Rosario telephone systems belong to and are operated by the Compañia Unión Telefónica (Union Telephone Company), a British concern, which operates in addition systems in Alberdi, Casilda, and San Lorenzo, besides Buenos Aires and about 50 cities and towns of the Province of Buenos Aires. The company now has some 3500 subscribers at Rosario.

According to data published in 1913, Argentina had 71 different telephone companies on December 31, 1912, of which 13 were railway companies possessing private telephone systems. Total capital invested in telephone lines was $14,755,030 and companies had 1,202 stations, 63,747 telephones installed, 54,777 subscribers, 4,494 employes, and 184,552 miles of line.

Chicago Second in Postal Savings

The effect of the European war on postal savings deposits in the United States is noticeable to a marked degree. Many post office patrons who were formerly in the habit of sending their savings abroad through the medium of the international money order service are now patronizing Uncle Sam's saving system, as is shown by unusual gains in deposits throughout the country. Chicago has just set a unique record by reporting a larger gain in deposits for July, August and September than for the entire preceding year. During the three months the net gain was $521,339, bringing the total amount on deposit up to $2,827,271. Seven thousand one hundred and sixteen new accounts were opened during that period, increasing the number of depositors to 21,659, each of whom has an average balance to his credit of $131. Chicago stands second in the list of American cities ranked by postal savings deposits.

Humboldt Exchange, Equipped with Automatic.

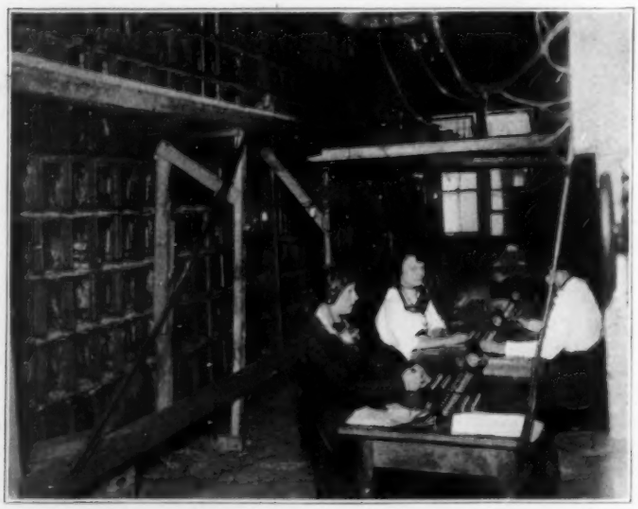
Restoring the Main Distributing Frame in Ellicott Exchange After the Fire.

Federal Repairs Fire Damage With Automatic

To repair completely the damage done to its 25,000-station Buffalo system by a fire which completely destroyed its terminal room, and to change from manual to automatic operation in that city within ten days is the feat performed by the Federal Telephone and Telegraph Company, and establishes a record which, it is believed, has never been equaled or even approached before.

At 6 o'clock on the morning of Friday, September 25, high potential current entering on one of the company's lines started a blaze in the main distributing frame, which within a short time completely wrecked it and placed the entire Federal system in Buffalo out of service. In addition the flames damaged the complaint desk beyond repair, and the wire chief's and information desks were so injured as to require complete reconstruction.

Besides this havoc, the water used to extinguish the flames entered every cable connected to both sides of the main frame and they all had to be removed and replaced before service could be restored.



Temporary Complaint Desks Installed Immediately After the Fire.

A brief survey of the situation convinced the Federal Company's officials that this was not the time for any half-way makeshift measures. The crisis had to be met promptly and vigorously, but it was necessary that all reconstruction work be of a permanent nature.

The first consideration was the restoration of service as promptly and completely as possible. When the fire occurred, the three new automatic branch exchanges were practically ready for service, but had not been cut in, being held for the completion of the automatic installation at the Main exchange, at which place the fire occurred. These branches are located in the outlying sections of the city and serve the majority of the residence stations. It was, therefore, possible to cut them in at once and within thirty hours after the fire service had been restored to approximately one-half of the subscribers.

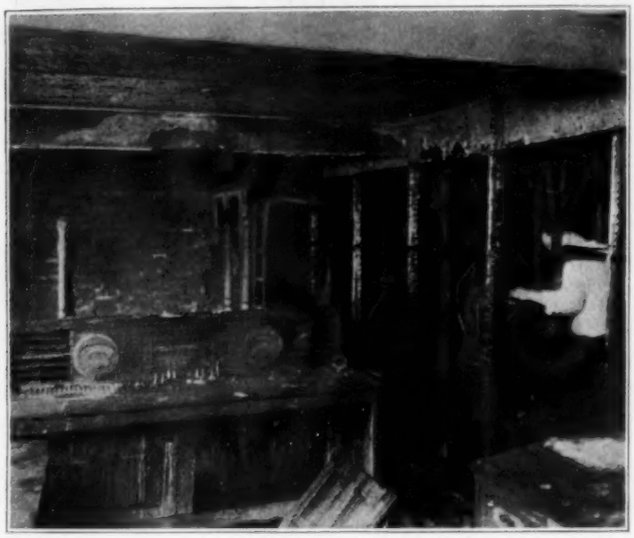
At the Main exchange the first task was to clear away the debris and this was started even before the ruins were cool. Every available man, his hands protected with gloves, was set to work stripping the main frame bare to its metal skeleton. Others started to cut the ruined cables at the point where they entered the exchange building, while still more began to unsolder the connections which joined the automatic central office equipment, practically ready for the cut-over, to the cables running to the main frame.

The next step was to obtain material to replace that destroyed and by 8:30, central time, three hours after the fire, Automatic Electric Company of Chicago, which had built and installed the automatic equipment, was in possession of all the details of the disaster and knew exactly what was required to repair the damage.

Adopting the slogan "First things first," that factory began turning out the necessary cables, jumper wire, relays, protectors and other material needed, in the order in which they could be used most effectively by the men on the job. The first shipments were made by noon of the day of the fire, so that the required material was ready at hand as soon as the work of clearing away had been completed. From that time on shipments arrived in such sequence that at no time was the work delayed through waiting for material.

An idea of the amount of equipment required can be obtained from the following summary: A total of approximately 135,000 feet of jumper wire, 35,000 feet of formed cable of various sizes, 15,000 protectors and 350 relays were sent to Buffalo by Automatic Electric Company to replace that damaged by the fire. The installation work involved necessitated the placing in position of all this material, the unsoldering of 20,000 connections, and the soldering of 80,000 connections. The main frame was completely stripped, new protectors mounted, new cable on both the line and switchboard sides fanned out and connected, and new jumpers put in. The wire chief's toll, recording and information desks were re-equipped, while temporary complaint positions constructed on kitchen tables were installed.

It is particularly worthy of note in this connection that with the exception of the complaint desks, none of this work was of a temporary or makeshift character.



After the Fire in the Terminal Room of Ellicott Exchange, Just Before the Automatic Cut-over.

All was done carefully and permanently, and when the restoration was completed the exchange was in as good condition as though no emergency had ever existed. And all of this work was accomplished and the service completely restored within ten days after the fire.

Kellogg's Automatic Recall

Three exchanges of the Pittsburgh & Allegheny Telephone Company, at Sewickley, Bellevue and Oakmont, are each to have a new and latest type automatic recall switchboard as manufactured exclusively by the Kellogg Switchboard and Supply Company.

Each of these three exchanges will have an ultimate capacity of 800 common battery lines. They will offer to the subscribers of these towns a service unequalled by any other type of present-day equipment.

Every telephone user will have automatic recall, the advantages of which have been proven many times over in the exchanges equipped with Kellogg type automatic recall boards. They will have secret service; and also automatic listening, which means more than anything else that they will have the promptest service.

To bear out this point, we give below a few lines from a comprehensive write-up describing a Kellogg exchange for the benefit of another town with the idea of improving the service:

> Yesterday, when the Troy exchange was cut over, there were such instantaneous replies to calls at the central office that the subscribers were startled. They were too slow! The operator's voice came over the wire before the receiver was at the subscriber's ear. This was such an innovation to the people of this town that all day they used the telephone to inform other people of the unusual change in the system.

The Kellogg Company will furnish complete power plant equipment with four-party harmonic ringing, the practical and economical features of which have long been tried and proven of the greatest success.

The Kellogg Company will also furnish complete new telephone equipment, these sets being of the new induction coil type which have proven so excellent on local as well as long distance service. Mr. Muhlheizler, chief engineer, is highly complimented on his selection of this equipment.

Things have been stirring in the Pittsburgh & Allegheny Telephone Company's organization in the last fourteen months. In addition to what has already been done in Pittsburgh proper, especially to improve the long distance toll lines, these new exchanges carry out the economical, energetic management of the Pittsburgh & Allegheny Company for the furnishing of a better telephone service and the placing of the company on an even firmer foundation. Incidentally, the company has also been following up an interesting advertising campaign.

Referring again to the long distance toll lines to the main exchange at Pittsburgh, these have been in cables for many years but have now been brought in in open wire. This improves the long distance transmission 35 per cent, doing away with a great deal of previous losses in the cable.

General improvements of this nature for the benefit of the property are now going on and are being planned for continually.

The present officers of the company are: Cyrus Huling, president; Richard Hawkey, vice-president and general manager; Louis Muhlheizler, chief engineer, and C. D. Thompson, purchasing agent.

Jacksonville Home Increases Automatic Installation

The Jacksonville Home Telephone Company of Jacksonville, Fla., which began operating its full automatic system on September 1 of this year, has found it necessary to increase its facilities and has placed an order with Automatic Electric Company of Chicago for equipment aggregating 2,500 lines and telephones, to be added to its Main and Riverside exchanges.

This order was placed thirty days after the Home Company began rendering service and gives ample evidence of the success the Home Company is achieving. In fact, the chief difficulty it has encountered has been to install instruments rapidly enough to keep pace with the demands of new subscribers who urgently requested to be furnished service as quickly as possible.

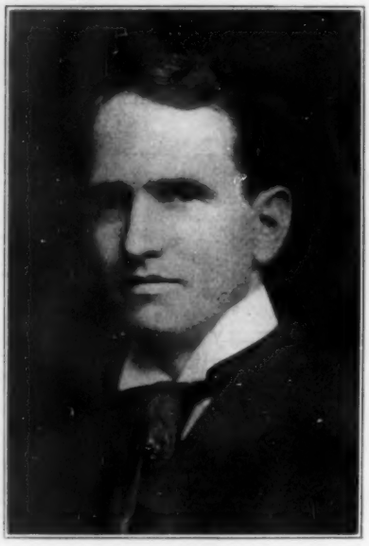
The Jacksonville Company had solicitors in the field for about five weeks, after which it was deemed advisable to recall them, a total of more than 7,000 signed contracts being obtained during that time. At present the company is confining its attention to caring for the prospective patrons who come to the office of their own accord, but with the installation of the new equipment just ordered active steps to increase the list of subscribers will be resumed.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES.

Sergius P. Grace, for more than ten years chief engineer of the Central District Bell Telephone Company in Pittsburgh, has been appointed assistant engineer of the Public Service Commission of New York state in the investigation and appraisal of the New York Telephone Company. Mr. Grace left Pittsburgh in 1913, shortly after the consolidation of the Central District Company with the Philadelphia Bell Company, and since that time has been in general consultation work in New York. He is a graduate of the University of Michigan, class of 1896, in electrical engineering, and obtained an advanced degree in 1904 in recognition of engineering work in the telephone industry. He was electrical engineer of the Detroit Telephone Company; chief engineer of the Detroit Switchboard Company; chief engineer and operating manager of the Peoples Telephone Company of New Orleans, La., while still acting as consulting engineer for the Detroit company; expert witness for the New Orleans Board of Trade and Cotton Exchange of Louisiana; engineer of the Erie Telephone System; superintendent of equipment of the Southwestern Bell Telephone Company; built independent plants in Texas; chief engineer of the Interstate Telephone Company of New Jersey; engineer of the American Telephone and Telegraph Company; chief engineer of the Central District Telephone Company of Pittsburgh, and general superintendent of plant of the same company. He originated many designs which became standard practice with the Bell companies, and assigned a number of valuable and important inventions to those companies. He has been very active in technical societies and is past president of the Engineers' Society of Western Pennsylvania.



Sergius P. Grace.

Alfred Slater, general manager of the Independent Telephone Company, at Savanna, Illinois, has resigned.

Thomas E. Hardgrove, local representative of the New York Telephone Company, at Elmhurst, dropped dead September 21, at Twenty-first street and Woodside avenue. His death was due to apoplexy.

Floyd Wilson, for two years employed by the Nebraska Telephone Company at Omaha, has been transferred to Neola by the company where he has been assigned to the position of wire chief.

Angus S. Hibbard, who for many years was identified with the Chicago Telephone Company, has returned from New York to make his home in Chicago. Mr. Hibbard left for New York about three years ago to become head of a department of the American Telephone & Telegraph Company. He will establish an office in the Bell Telephone Building, but will not be actively connected with the Chicago company.

Vice-President Phillip Hanlin of the Mountain States Telephone & Telegraph Company, has resigned, according to an announcement at the general offices of the company in Denver, and has purchased the control of the telephone properties in northern Idaho and will take charge of them.

October 1, A. H. Young, formerly manager of the Cumberland Telephone & Telegraph Company at Hickman, Kentucky, assumed his new duties of assistant district manager for the company at Union City, Tennessee.

Courtney C. Prince died at his home, 4015 Washington boulevard, Chicago, October 2. Mr. Prince was sixty-two years old and had been in the employ of the Chicago Telephone Company for thirty-six years.

Fifteen years ago, after trying his hand at various vocations, a young man decided to adopt telephony as a profession and soon found that he could consistently stay in that and still have varied vocations, for he found the field so broad that he has not thus far made the full round of all its branches. It has been a "profession" to him from the beginning, and consequently, he became a free lance, working sometimes for the Bell interests, and more often for the independent, always keeping his eye on opportunity. The subject of our study is Arthur Kneisel, who was born July 11, 1880, at Louisville, Ky., and attended the grammar schools and graduated from the Manual Training High School of that city in 1897. Later he attended Kentucky State University, entering the sophomore and junior work by eliminating all prior work through examinations. In 1899 he began his telephone career as jumper man for the Cumberland Telephone & Telegraph Company, and was soon promoted to trouble clerk and to wire chief. Then he worked for the Stromberg-Carlson Telephone Manufacturing Company on its installing force and as wire chief for the Clarksville, Tenn., Home Telephone Company. In 1902 he joined the engineering force of the Faller Automatic Telephone Exchange Company, thus becoming one of the first semi-automatic engineers of America. He represented that company at its exhibit at the St. Louis World's Fair. Later he became manager of the Eastern New York Telephone & Telegraph Company at Hoosick Falls, N. Y., and while there made some very decided improvements in the Mayberry-Holmes eight-party selective ringing lock-out system in use at the time. So successful was Mr. Kneisel's war upon the Bell Company at Hoosick Falls that the Western Electric Company enticed him away to New York, where he was given charge of the apparatus division of the engineering laboratory. In 1908 he joined the force of the Chicago Telephone Company, and eventually rose to instructor in its plant department school. In 1911 the North Electric Company annexed him to its Automanual engineering staff, and when the Telephone Improvement Company took over the North Electric Company he entered the patent department of that company. Mr. Kneisel took up the study of patent law, and easily passed the requirements for registration as attorney in the United States Patent Office. While in the patent department of the Telephone Improvement Company he made studies of over 800 automatic and kindred patents and served as patent expert in important interference and infringement suits. He has numerous inventions in manual and semi-automatic telephony to his credit. Recently Mr. Kneisel was appointed assistant city telephone supervisor of Chicago, that city thereby securing the benefit of his wide experience in its Department of Public Service under Commissioner Montague Ferry.

Arthur Kneisel.

G. Willis Cummings, telephone supervisor for the city of Chicago, a sketch of whose career appeared in this column last month, has been subjected to considerable bantering because we gave the date of his birth as 1847 instead of 1874, to say nothing of spelling his penultimate name Wilson instead of Willis. However, we have done worse things than that to some of our friends.

Frank F. Fowle, one of the receivers of the Central Union Telephone Company has closed his New York consulting office, and moved his headquarters to Chicago, Illinois.

George Annan of Springfield has been made manager of the

Independent Telephone Company in Savanna, Illinois, succeeding Alfred Slater, resigned. Mr. Annan has served as manager of the exchange at Sterling for a period of seven years.

J. Arthur Peterson, a lineman employed by the Galesburg Union Telephone Company of Illinois, was electrocuted September 24, when he came in contact with a live wire while doing some work on a telephone pole. Mr. Peterson's home was in Monmouth.

Joseph Huntington, for many years head lineman for the Bureau County Independent Telephone Company at Princeton, Illinois, has severed his connections with that company and will leave shortly for Michigan, which state he expects to make his future home.

C. A. Borkland, who has been the local manager of the Western Electric Telephone system at Rock Rapids, Iowa, for the past five years, has resigned his position and left for Clarkfield, Minn., where he will enter into business. Mr. Borkland was at one time connected with the exchange at Sioux City and Hawarden. James Flood, of Bancroft, succeeds him.

B. L. Berry has succeeded F. A. Gaddy as superintendent of the Southern Bell Telephone Company, at Columbia, S. C. Mr. Berry is from Greenville, where he has been in the employ of the company for more than ten years.

Commercial superintendent T. P. Cagwin of the Cleveland Telephone Company is convalescing at his home, 32 Carlyon Road, East Cleveland, Ohio.

A. A. Garret, former local manager of the Southwestern Telegraph & Telephone Company at Little Rock, Ark., has been succeeded by G. C. Scott, formerly chief clerk.

The employes of the Missouri & Kansas Telephone Company in St. Joseph, tendered a banquet at the St. Francis hotel, in honor of P. J. Ramsey, who has resigned as division plant superintendent of the company here to engage in business in Cincinnati. Mr. Ramsey will be succeeded by H. D. Livers, who is now connected with the company in Kansas City.

C. S. Powell, manager of the South Texas Telephone Company at Port Arthur, Texas, had both his legs broken October 3, as the result of jumping from an automobile while going to a fire.

Manager W. T. Herndon of the Carlisle office of the Cumberland Telephone & Telegraph Company, has been appointed manager at Stanford.

Frank Feather, who has been acting as assistant manager of the Worcester, Mass., telephone exchange, has been appointed manager of the Keene exchange to succeed William A. Collender, who recently resigned on account of ill health.

Ernest C. Wilcox, president of the Connecticut Telephone & Electric Company at Meriden, Conn., was elected director of the Electrical Contractors' Association of Connecticut, which was recently formed at New Haven.

R. M. Caskey, inspector for the Iron Mountain Railway Telephone system at Alexandria, La., is suffering from a fractured skull which he received by falling from a pole.

Charles Edward McCluer, an old-time telephone and telegraph man died at Tarboro, N. C. Mr. McCluer was born in Indianapolis in 1836, and at a very early age began his career as telegrapher. He was superintendent of the Southern Bell Company at Richmond for twenty-three years.

Gus T. Graham has resigned his position as manager of the Mexico branch of the Southwestern Telegraph & Telephone Company.

After forty-four years with the Bell Telephone Company, in Michigan, James Beamer has retired on a pension. Mr. Beamer began his life's work in 1863, when he helped string the first telegraph line between Saginaw and Detroit. For several years he was in the employ of the Western Union in various capacities. Shortly after the introduction of the telephone he became a lineman, at which work he has continued ever since. Although retired by the pension plan, the veteran still takes an active interest in the affairs of the company.

N. A. Kelly, who has for three years been chief clerk to manager M. L. Levy of the Bell Telephone Company at New Castle, Pa., has been promoted to salesman for the company in that district.

R. E. Green, representative of the Standard Underground Cable Company at Chicago, has been appointed manager of the Detroit office, which the company opened on October 1.

Miss Amelia Kramer, veteran chief operator of the Bell Telephone Company in Cleveland, Ohio, retires on a pension after thirty-two years of service.

H. B. Wagner of Maine has succeeded J. Y. Hutchinson as traffic manager at Waco, for the Texas Telephone Company.

R. V. Hatfield has been appointed manager of the Bell Telephone exchange at Lyons, Kans., succeeding W. B. Oliverson, who has been transferred to Eureka.

ROLL OF THE STATES.

ALABAMA.

Springville Telephone Company has filed articles of incorporation, capital stock, $1,000. The company will put up a telephone exchange and do a general telephone business. J. L. Drennen of Birmingham, is president; Harris Burns, vice-president, and O. A. Shipman, secretary.

Articles of incorporation of the Delta Telephone Company of Delta, Clay County, has been filed in the office of Cyrus B. Brown, Secretary of State. The company has a capital stock of $5,000, of which $2,000 is paid in. A rural telephone system will be constructed in Clay county by the company.

The Southern Bell Telephone Company will buy 200 bales of cotton in this district. These are the instructions which have been received by district manager J. B. Casseles of Decatur. The Decatur office has already bought a bale, as have a number of the other offices in this district.

Articles of dissolution of the Cumberland Telephone & Telegraph Company of Alabama have been filed in the probate office at Decatur. Judge John C. Eyster of New Decatur was the vice-president of the company. The dissolution was by mutual consent. The stockholders were Judge John C. Eyster, George H. Knox, Jr., and Charles Carter.

CALIFORNIA.

The Pacific Telephone & Telegraph Company has commenced the construction of several new telephone lines in Sierra County.

Twenty-two out of twenty-five applicants passed the recent civil service examination for telephone operator in the city hall exchange in Oakland, according to the announcement of Frank Colburn, secretary of the Civil Service Board.

At a recent meeting of the stockholders of the Tehama County Telephone Company, a corporation financed by local capital, the proposition of selling to a newly organized company was discussed. It appears that a new company desires to purchase the plants of the independent companies and Pacific Telephone Company in Tehama and Colusa counties.

Nearly $100,000 has been set aside under the first allowances of the 1914-15 budget of the Sunset Telephone & Telegraph Company for expenditures in Southern California, in order to take care of the growing business of this district, according to an announcement made by division superintendent Mason. This expenditure is made in addition to $2,000,000 authorized last year and now being spent for the construction of the new Central Station on Hill street and the equipment required for that building.

CANADA.

Work will be commenced in a short time on the dominion government telephone lines in Nelson district. Announcement to this effect has been made by W. H. Stevens of Kamloops, B. C., superintendent of dominion telegraph and telephone construction in British Columbia. Inwood, Erinview and Winnipeg have had long distance telephone connections established.

The town of Fort Frances, Ontario, which has purchased and taken over its local telephone plant, has placed its order for all material and switchboard and equipment with the Canadian Independent Telephone Company. The system is to be in operation, it is hoped, by the first of the new year.

Instructions have been given by the Canadian government for the extension of the government telephone line, now being constructed from Grand Forks to Lynch Creek, to Franklin Park.

In the coming year about $2,000,000 will be spent by the government for telephone extensions and improvements. New exchanges will be built at Edmonton, Alta., and at Medicine Hat.

A three-minute fire started by a fuse blowing out in the Bell telephone exchange burned out the city and long distance switchboards and left the business section of Montreal without telephones.

The telephone system being installed by the Grand Trunk railway between Niagara Falls, Ont., and Detroit is fast nearing completion. The telephones will replace the telegraph in the dispatching of trains.

ILLINOIS.

Work on the underground cable which is being laid from the Central Union Telephone Company's new office in Rockford, through the city and across the river to Davenport, is progressing rapidly. Extra men have been employed and it is thought that within sixty days the cable will be ready for use.

The Wataga Farmers' Mutual Telephone Company has purchased a new switchboard, which will be installed as soon as possible.

The Illinois Telephone Company has installed a new tele-

phone system in the Waddell store, Jacksonville, having five stations, which greatly facilitates matters.

Work is being rushed on the new telephone building of the Central Union Telephone Company at Rock Island.

Arrangements to start the count of the automatic telephones in Chicago by the department of public service are almost completed, according to Commissioner Montague Ferry. After a conference with S. W. Tracy, vice-president of the Chicago Tunnel Company, Mr. Ferry announced that the officials of the company had agreed to submit their records to the city for inspection. These will be used in checking on the number of telephones in service.

The new switchboard for the Mutual Telephone Company, at Forreston, has arrived and will soon be installed.

Action upon the renewal of the franchise of the Bureau County Independent Telephone Company was again deferred by the Princeton city council. Alderman H. T. Jackson, chairman of the street committee, recommended the renewal of the franchise upon the old terms, but Alderman F. P. Mudge objected, stating that the committee as a whole had not considered the proposition. As the franchise is to run for twenty-five years, Mr. Mudge contended that careful investigation should be made before granting the telephone company the use of the public streets

The preliminary arrangements have been made by the Western Illinois Telephone Company of Macomb to rebuild its telephone system at Bushnell, at a cost of $15,000. What will be practically a new plant will be put in and it will be an all-metallic system, with central electric energy and the kind of sets which ring central automatically upon the receiver being taken down. Work will start at once.

Prominent business men and citizens of Geneseo have united in an effort to force the two telephone companies operating in that city to consolidate their interests. A petition signed by a large number of Geneseo people has been submitted to the city council and committees have been appointed to investigate.

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., has been incorporated in Illinois. The company manufactures electrical apparatus and constructs and installs telephone exchanges. The capital stock is $450,000 and the capital stock in Illinois is $50,000. The president is Frank M. Kondolf of Rochester, and the secretary, Wesley M. Angle of Rochester. The principal office in Illinois is at 708 West Jackson boulevard, Chicago.

INDIANA.

Lynnville Home Telephone Company, Lynnville, $2,000; to operate telephone system. H. Shumaker, R. Stocka, L. N. Meadows.

The promiscuous use of firearms in shooting at blackbirds that infest shade trees at night in Henderson, has done damage to the amount of $1,500 to wires and cables of the Cumberland Telephone Company. Several large cables containing over one hundred wires have been punctured.

The reproduction of the Indianapolis property of the Central Union Telephone Company is $3,926,492, according to an appraisal made by the company's engineers. The report of the engineers was filed with the Public Service Commission, September 29.

The Sullivan Telephone Company has begun extensive improvements on its building in Sullivan. The business office will be located on the first floor, and a handsome new front put in the building. Bath rooms and lavatories will be added, as well as a rest room for the employes of the company. A steam heating plant is also being installed.

The Lowell Telephone Company, Lowell, has dissolved.

The Jasper County Telephone Company has negotiated the sale of the Wolcott exchange, including the toll line from Remington through Wolcott to Seafield. The sale has to be approved by the state public service commission. The purchaser is J. C. Dixon, of Earl Park. The Wolcott exchange has about 370 telephones.

IOWA.

The Mount Ayr Mutual Telephone Company's new switchboard has been installed and is now ready for use. Besides laying underground cables and mains, together with the office fixtures, $9,500 has been expended.

At the annual meeting of the Brighton Telephone Company all the old officers were re-elected. They are: President, J. W. Myers; Vice-president, Henry Spielman; Secretary, Anson Brinton; Treasurer, W. H. Lloyd.

About 600 telephone lines were rendered useless when fire totally destroyed the James building and seriously damaged several other structures in the business section of Perry.

At the annual election of the German Mutual Telephone Company of Dixon, the following officers were elected: President, Louis Biester; Vice-president, J. H. Thede; Secretary, P. J. Thede; Treasurer, John Greve. Directors, Rudolph Zindle and George Rathjen, Dixon; C. H. Riese and Henry Steffen, Dixon; Theodore Peckenschneider and Joseph Kallenbach, Calamus.

Compliance is being made by the Western Electric Telephone Company of Rock Rapids, with an order of the city council to remove all wires and poles from Main street. They are being placed in the alleys.

Free telephone service to Norwich has recently been secured for the subscribers of the Independent Mutual Telephone Company of Shenandoah.

KENTUCKY.

Several farmers in the Carmel neighborhood have formed a stock company and have purchased the telephone lines in that vicinity east of the Milton and Bedford pike from the Cumberland Company. The new company will be connected with the Milton exchange, having service all over the county.

The new private telephone switchboard for the City Hall in Lexington has been installed.

A private telephone exchange is being installed in the J. A. Rudy & Son's establishment, 213 Broadway, Paducah, by the Home Telephone Company.

The Cumberland River Telephone Company, Barbourville; increasing capital from $1,000 to $2,500.

M. H. Dunlevy, manager of the Cumberland telephone exchange at Henryville, has personally purchased the Home telephone exchange there and expects to conduct the business.

The Allen County Home Telephone Company has purchased of the Allen County Cumberland Telephone Company's exchange at Scottsville.

LOUISIANA.

The Star Telephone Company, a local organization, has completed its line between Grosse Tete, Rosedale and Maringouin, and intends to extend same further as business demands.

Material has arrived for the construction of a telephone line from St. Francisville to Angola.

MARYLAND.

On October 14 the Baltimore Telephone Society began a series of lectures, which will be held once a month in Odd Fellows' Hall, Cathedral and Saratoga streets.

The Public Service Commission recently passed an order granting permission to the Chesapeake & Potomac Telephone Company to absorb the local telephone company in St. Mary's county, with headquarters at Charlotte Hall.

MICHIGAN.

The Birch Run Home Telephone Company has filed articles of incorporation with a capital stock of $20,000 to establish a home telephone company. The directors are: Chas. Wolohan, Wm. F. Hemmeter, Miles L. Hadsall, Ernest D. Helfrich and Clyde O. Trask. A good deal of the money invested in this organization is from Saginaw and some of the directors are local men.

New underground cables, pole lines and aerial cables are to be supplied by the Michigan State Telephone Company in the Walnut office district to prepare for the increased demand of that part of Detroit. The work, which will cost $5,000, will start immediately.

MINNESOTA.

With a view of building a new ten-story building later, the Northwestern Telephone Exchange Company at Minneapolis has started work on the reinforcement of the foundation of the present four-story biulding at Third avenue south and Fifth street. Stairways are being changed and elevators placed in the old building and it was decided to make the foundations permanent and sufficiently large for the contemplated structure.

The Northwestern Telephone Company has cut over from the old to the new switchboard in the new Northwestern Telephone building on Sixth avenue North, St. Cloud.

Electric and telephone companies object to the joint usage of poles in the residence districts of Minneapolis, and have laid over the ordinance until a later meeting.

At a special meeting of the Floodwood Telephone Company the resignation of four directors was presented to the meeting as follows: E. B. Robinson, Joseph G. Fogarty, M. A. Robinson and M. W. Hingeley. On motion the resignations were accepted. Frank J. McDonald, who recently acquired a controlling interest in the outstanding stock of the company, was chosen as president, J. A. Blackwood vice-president, and Charles Osborn of Cloquet, secretary-treasurer. The directors are: F. J. McDonald, Oliver Olson, Charles Osborn, M. H. Schussler and J. A. Blackwood. It is the intention of the new management to rebuild the system here by the installation of a metallic system in place of the one now in use and to extend the lines now into the rural district.

MISSISSIPPI.

The Cumberland Telephone Company's exchange at Utica was destroyed by fire.

The Cumberland Telephone & Telegraph Company will begin construction of a $30,000 or $40,000 three-story brick building on the corner of Twenty-third avenue and Seventh street Meridian, about January 1, according to partial information in the hands of manager C. G. Christian.

MISSOURI.

The telephone line from Maryville to Graham, built by the exchanges of the Peoples' Telephone Union of the two towns has been opened.

The Waverly Telephone Company, Waverly; capital, $35,000. Incorporators, H. I. DeTurk, A. C. Moffett, A. W. Reagel.

A contract for a modern police alarm system, which will be installed within four months, has been entered into by the city commission and the Home Telephone Company at Joplin. Alarm boxes will be placed along Main street and in Villa Heights, Chitwood, Blendville and East Joplin. The Telephone Company will install the system and keep it repaired, charging the city $1,305.60 a year. In addition to the boxes, there will be a switchboard at police headquarters. The system will be separate from the company's telephone plant and calls will be flashed directly to the station board without the manipulation of a central girl.

The Bell Telephone Company at Rockford, some months ago filed with the State Utilities Board, notice to the effect that patrons of the rural lines who had been getting service at $1.50 a month would be required to pay $2.00. The Board instituted an inquiry to determine if there were just grounds for such an increase, and found none, and notified the Bell Company that it could not sanction the proposed increase. The Missouri farmers will receive first-class service at the same rates.

MONTANA.

Telephone communication was demoralized in Deer Lodge, by the snow which continued steadily for two days the early part of the month. On account of the high temperature the wet snow packed on the limbs of the trees and wires with an enormous weight.

NEBRASKA.

Directors of the Independent Telephone Company at Tecumseh announce that $10,000 worth of stock has been sold and that lines will be built.

The annual meeting of the Blue Springs Independent Telephone Company was held October 13, at Blue Springs. Officers for the ensuing year were elected as follows: President, J. H. McPheron; Treasurer, R. B. Clemens; Directors, C. H. Mason, S. L. Pyle.

NEW JERSEY.

Chancellor Walker has named James Kerney of Trenton as receiver for the Bordentown Telephone & Telegraph Company. The Inter-State Telephone & Telegraph Company, which is also in the hands of the receiver, is the principal stockholder.

NEW YORK.

The cable rooms of the Federal Telephone Company at Buffalo, were destroyed by fire September 25. Twenty-five thousand telephones were put out of commission for ten days.

The American Telephone & Telegraph Company's subscription receipts for convertible 4½ per cent bonds, due in 1933, have been removed from the list of the New York Stock Exchange.

The common council on September 21 revoked the franchise of the Albany Home Telephone Company and directed the removal of all its poles and wires from the city streets.

The Ravena & Indian Fields Telephone Company has filed its organization certificate with Secretary of State May. Its lines are to extend from the city of New York to Albany and to Buffalo, and intermediate cities and towns in this state, also to cities and towns in Vermont, Massachusetts, Connecticut, Ohio, Pennsylvania and New Jersey. The capital stock is placed at $1,000, divided into 40 shares. The directors, each of whom takes one share, are: Leonard A. Warren, Harry McK. Curtis, Helen W. Curtis, Margaret E. Warren, Iantha M. Carter and J. Armstrong Hotaling, all of Coxsackie, and Louise Winne of Ravena. No principal office is given.

The switchboard of the Rochester Telephone Company, installed in the Stone Exchange, was formerly accepted by the Board of Directors and is now doing its part in the city's telephone service. It is one of the largest boards in western New York, having 15,000 direct lines, proportionately more of party lines. An unusual feature of the board is an original automatic trunking device worked out by the Stromburg-Carlson Telephone Manufacturing Company. This automatic feature selects numbers reached on the new board, although the calls may come in on the old switchboard.

The New York Telephone Company has announced some extensive and important improvements, which it is believed will result in better service to Uticans, especially in connection with toll messages. The company has begun the installation of some new and very large cables in Genesee street, a job that will require about three months and involve a large expenditure.

Plans for the new exchange of the Rochester Telephone Company to be erected in Broezel street, Rochester, have been completed by J. Foster Warner and accepted by the Board of Directors. The contract will be let within a fortnight and work will begin about November 1. The exchange will be in service early in 1915. The ground dimensions are forty by seventy-two feet, with two stories over a basement. The outside walls will be of tapestry brick and the building will be fireproof. The basement will be given over to battery rooms and storage. The first floor will be divided into offices and rooms for apparatus. In the top story will be the switchboard with a capacity of 3,000 direct lines. There will also be the operatives' quarters, retiring rooms, dining room, kitchen and lockers. The equipment will be modern and will make adequate exchange service possible in the northwest section.

Vice-president Frank N. Bethell of the New York Telephone Company, testified recently that telephone traffic had fallen 15 per cent in lower Manhattan and to some extent all over New York City on account of general business depression consequent on the war.

The Evolution Telephone Company, Manhattan.—Manufacturing and deal in electrical and mechanical devices; capital, $25,000. Incorporators: T. F. Styles, Jamaica; H. G. Pape, I. B. Pape, New York City.

NORTH CAROLINA.

The Southern Bell Telephone and Telegraph Company has just installed a private branch exchange for the Jefferson Standard Life Insurance company in their new offices at Greensboro.

The city commissioners at Greensboro, at a recent meeting passed an ordinance requiring all wooden telephone and telegraph poles to be removed from Elm to Church street and the Southern Railway station within the next sixty days.

NORTH DAKOTA.

The city council at Cooperstown has ordered telephone poles removed from the main street of the town.

New Leipzig will have a telephone exchange.

The Sheyenne Telephone Company is extending its lines west of Pekin.

OHIO.

The Bell Telephone Company of Cleveland has issued notice of changes in names of four exchanges to better the service. Under the change, Broad becomes Broadway; Ridge becomes Edgewater; South becomes Harvard and East becomes Rosedale.

That the Central Union Telephone Company is spending a large sum of money in laying underground conduits and stringing new wires was the announcement made by Manager A. C. Arend. Six hundred new pairs of wires are being installed in the West End conduit system, which is being laid between Lowry avenue and Court street in West High street, Springfield.

Manager W. M. Welker states that the Ohio State Telephone Company has given to its branch at Massillon $69,000 for extensive improvements on its city lines and the installation of a new switch board.

The new Main exchange of the Cincinnati and Suburban Telephone Company, at Fourth and Hammond streets, Cincinnati, will be put in operation November 15.

The Northwestern Telephone Company, a merger of the Bell and Independent interests, has put its new automatic telephone system in operation at Defiance. Its cost approximated $150,000.

The Bryan Telephone Company of Bryan, has applied to the utilities commission for authority to purchase 215 shares of stock of the Edon Home Telephone Co., for the sum of $2,687.50.

Earnings of the Ohio Telephone Company for August showed about 6 per cent for the year on the common stock, according to a report of the officers of the company.

OKLAHOMA.

The Impson Valley Telephone Company of Jumbo, capital $2,000; incorporators, A. W. Thomas, B. S. Bedford, Jumbo; J. C. Goodjoin, Miller.

The Yale Telephone Company is extending its lines fifteen miles, and will spend $5,000 on improvements. The company now has over 500 subscribers, is stringing private lines to the oil fields, and into the offices of the Silurian, McMann and Quaker companies.

OREGON.

The Pacific Telephone & Telegraph Company has just leased the new two-story brick building at the northeast corner of

Union avenue and East Ash street, Portland, for a long term. It covers 100 x 100 feet, has 20,000 feet of floor space, which will be used as a storehouse for the telephone company for Oregon, Washington and Idaho.

A new telephone line has been opened between Silver Lake and Bend.

PENNSYLVANIA.

M. D. Lathrope has been appointed receiver for the Anthracite Telephone Company, of Carbondale. The company debts amount to $27,000, and it is capitalized at $20,000.

Bell Telephone of Pennsylvania, regular quarterly 1½ per cent payable October 15 of record October 5.

The Telephone Society of Harrisburg, composed of telephone veterans, held its regular monthly meeting after the summer recess in the Board of Trade hall, September 21.

Stockholders of the Central District Telephone Company, Pittsburgh, will hold a special meeting at 9:30 a. m., December 10, for the purpose of voting on the proposed purchase of all the capital stock of the Burgettstown Farmers' Telephone Company for $25 a share and all the stock of the Prospect Telephone Company for $10 a share.

A special meeting of the stockholders of the Bell Telephone Company of Pennsylvania, will be held in Philadelphia on December 4 to take action on the purchase of the property of the Fairview Telephone Company and the Chandeford Telephone Company. The Bell Company will agree, it is understood, to pay the stockholders of the two companies $10 a share for their stock.

TENNESSEE.

At a recent meeting of the Board of Directors of the Home Telephone Company of Lebanon, James D. Jennings was elected manager. The directors' meeting was followed by a meeting of the stockholders, who elected the following officers: Henry Garret of Vine, president; Homer Hancock of Baird's Mill, treasurer, and Ed Nichols, secretary.

The Edith-Nankipoo Telephone Company has entered Halls and is installing a switchboard over the People's Savings bank. The new company will start with about fifty boxes. W. J. Satterwhite, formerly with the Cumberland company, will be manager.

The handsome, modern fireproof central office building of the Cumberland Telephone & Telegraph Company at 199 Court avenue, in which has been installed the latest type of switchboards and equipment, will be put into service some time during November. The new building and equipment and other additions to the Bell telephone system in Memphis represent investment of more than a million dollars. When the service is cut over to the new building, Memphis will possess a telephone system unequalled by any in the United States, and the service will be a matter of pride to the entire community.

Officers elected at the closing session of the Tri-State Telephone Association convention at Jackson, recently, were: W. H. Bryant, of Mobile, Ala., president; J. B. Duncan, Knoxville, Tenn., vice-president; W. N. McAnge, of Corinth, Miss., secretary-treasurer. Memphis was selected as the meeting place in 1915, the dates to be fixed by the executive committee.

The Gainesboro Telephone Company proposed to expend $40,000 for improvements and extensions in its territory within the next few months.

TEXAS.

The Orange Home Telephone Company, under the direction of manager Hemphill, has started some extensive improvement work on the city lines. Among other improvements made is the removal of old cables and replacing them with new ones.

The San Antonio Traction Company has installed a private telephone system for dispatching and regulating street cars.

The charter of the Texas Telephone Company, capital stock $2,000,000, with headquarters at Waco, formed for the purpose of conducting an independent telephone business in Texas, and which, it is said, will absorb several of the smaller companies now operated by the Earle and Hyde interests, including the Brazos Valley Telegraph and Telephone Company, which operates the Waco exchange, has been filed in the office of the secretary of state. The officers of the Texas Telephone Company will be the same as the present officers of the Brazos Valley company, who are: J. B. Earle, president; Ben C. Hyde, vice-president, and E. C. Blomeyer, secretary-treasurer.

A large force of men are at work cutting into the pavement on East Erwin street, Tyler, preparatory to the installation of the cable of the Southwestern Telephone Company. All lines around the square are to be put underground. The new telephone building, corner of South Bois d'Arc avenue and West Erwin street, will be ready for occupancy by Nov. 1.

Baker Brothers are installing a new telephone system in Millicon. More than one hundred phones will be installed and the work is being done rapidly.

The newly organized Texas Telephone Company will erect a seven-story fireproof building at the corner of Leath and Columbus streets, Waco, in the near future.

The Floresville Rural Telephone Company is now installing a 100-drop switchboard at Poth. Heretofore the service to this place was over party lines and this is the first exchange installed there.

The annual convention of the Texas Independent Telephone association will be held in Waco, November 5 and 6 at the Riggins hotel. A large number of delegates are expected to be present.

The Southwestern Telegraph and Telephone Company has a force of men putting up a cable from the central office in Alice to the northern limits of town.

Additional switchboard facilities are being added to the local exchange in Terrell, which will provide for 280 additional telephones.

A resolution was passed by the city commissioners June 9, calling upon the Brazos Valley and the Southwestern Telephone Companies operating in Waco to consolidate.

Windom Telephone Company, Windom; capital stock $5,000. Incorporators: A. L. Clark, J. J. Cappleman and E. P. Price.

VIRGINIA.

The Augusta County Farmers' Mutual Telephone Company, Staunton. Capital stock, $2,000 to $25,000. Conduct a telephone system. Cyrus H. Cline, president, Mount Solon, Va.; L. B. Stephenson, secretary, Rolla, Va.

The Otto Creek Telephone Company of Autherford county; capital $1,500, for establishing rural telephone lines. Incorporators, L. D. Allen and others.

September 19, the Chesapeake and Potomac Telephone Company, cut into its new headquarters, the handsome new two-story building on Main street, Suffolk.

The annual meeting of the Lynchburg Telephone Society recently resulted in the election of the following officers: President, W. M. Taylor; vice-president, W. M. Oakey; secretary-treasurer, J. W. G. Wallace, and executive committee, W. R. Buckley and C. S. Rapp.

On October 29 and 30, the fourth annual meeting of the Telephone Pioneers of America will be held in Richmond, at the Jefferson hotel.

WASHINGTON.

The Capitol exchange of the Pacific Telephone and Telegraph Company was formally opened and placed into service October 10.

WISCONSIN.

Articles of incorporation have been filed with the register of deeds at Merrill, by the Gleason Telephone Company. The capital stock is $5,000 and the incorporators are R. H. Smith, S. G. Meany and W. P. Levia.

The Norwalk Independent Telephone Company, Madison, was authorized recently by the railroad commission to discontinue its rate of 75 cents per month for telephone service and to substitute a rate of $1.25 per month, allowing a discount of 25 cents on bills paid on or before the last day of the current month.

After appropriating more than half a million dollars for improvements to be made throughout the city and state, the directors of the Wisconsin Telephone Company, at their meeting in October, voted the payment of a quarterly dividend of $2 per share, payable immediately. Construction and reconstruction work to cost $250,000 is already under way in Milwaukee, while $300,000 worth of improvements to toll lines and exchanges throughout Wisconsin will be begun at once.

A new long distance telephone line has just been opened between Hurley, Ironwood and Rhinelander.

After some delay awaiting the arrival of building materials, the work on the addition to the Oshkosh telephone exchange has been resumed, and the work will be pushed rapidly from now on. The addition is to be ready for occupancy by the middle of November.

The state railway commission denied the application of the St. Croix Telephone Company of St. Croix to extend its lines into the towns of Ceylon and Emerald, where the West Wisconsin Telephone Company is already operating.

Because of an increase in business, the Wisconsin Telephone Company has decided to erect a new exchange to be known as the Mitchell exchange, at Sixteenth and Lapham streets, Milwaukee. Operation is expected about January 1, with a connection of about 1,800 phones. The company also expects to lay about $35,000 worth of wire cable during the next year.

Westboro Telephone Company, Westboro; capital, $2,500. Incorporators: J. W. Kaye and five others.